IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

AS HOLDINGS, INC. Opposer, v. H&C MILCOR, INC. f/k/a AQUATICO OF TEXAS, INC. Applicant.	)	Opposition No. 91182064 Serial Number: 76/461,157 Mark: Miscellaneous Design: (Pipe Boot Product Design)

CERTIFICATE OF SERVICE AND MAILING

I hereby certify that the enclosed Opposer's Second Notice of Reliance and attachments in the above-identified Opposition are being deposited with the United States Postal Service as Priority Mail addressed to:

United States Patent and Trademark Office
Trademark Trial and Appeal Board
P.O. Box 1451
Alexandria, VA 22313-1451

on June 29, 2009; and also certify that on June 29, 2009 a true and complete copy of Opposer's Second Notice of Reliance and attachments have been sent by U.S. Priority Mail, postage prepaid to Applicant as follows:

Dillis V. Allen
105 S Roselle Rd, Suite 101
Schaumburg, IL 60193

Dated: June 29, 2009

Terence J. Linn
Matthew D. Kendall
Van Dyke, Gardner, Linn & Burkhart, LLP
2851 Charlevoix Drive SE, Suite 207
Grand Rapids, MI 49546
Attorneys for Opposer

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AS HOLDINGS, INC.	)	
	)	
Opposer,	)	
v.	)	Opposition No. 91182064
	)	
H&C MILCOR, INC. f/k/a	)	
AQUATICO OF TEXAS, INC.	)	Serial Number: 76/461,157
	)	Mark: Miscellaneous Design:
Applicant.	)	(Pipe Boot Product Design)
	)	

OPPOSER'S SECOND NOTICE OF RELIANCE

As required by 32 C.F.R. § 2.122 and the Trademark Trial and Appeal Board Manual of Procedure (TBMP) Section 704.02, this Notice of Reliance serves to notify the opposing party, H&C Milcor, Inc., that AS Holdings, Inc. intends to rely on the materials hereunder in support of its case.

Opposer has previously filed the following patents identified in discovery depositions as Opposer's Exhibit 12 and Applicant's Exhibit 13, as exhibits to testimonial depositions pursuant to agreement with opposing counsel. A stipulated motion confirming that agreement has been filed with the Board. Because the motion has not yet been granted, as a precaution Opposer also submits this Second Notice of Reliance.

Opposer makes of record the following patents issued by the United States Patent Office, copies of which are submitted herewith:

Patent Number	Issue Date	First Named Inventor/Title
U.S. Patent No. 4,211,423	07/08/1980	Resech/ Roof Seal Device
U.S. Patent No. Des 269,454	06/21/1983	Houseman/ Seal for Roof Vent Pipe or Similar Article
U.S. Patent No. Des. 287,872	01/20/1987	Eriksson/ Sealing Device for Surrounding the Point of Emergence of a Pipe from a Wall or Floor
U.S. Patent No. 917,167	04/06/1909	Shaw/ Roof Flashing
U.S. Patent No. 2,985,465	05/23/1961	Church/ Roof Flange Construction
U.S. Patent No. 3,704,894	12/05/1972	Didszuhn/ Bellows Sleeve

U.S. Patent No. 3,807,110	04/30/1974	Kaminski/ Multipurpose Roof Penetrating Curb
U.S. Patent No. 4,010,578	03/08/1977	Logsdon/ Roof Flashing Structure
U.S. Patent No. 4,211,423	07/08/1980	Resech/ Roof Seal Device
U.S. Patent No. 4,318,547	03/09/1982	Ericson/ Device Used for the Connection of Pipes
U.S. Patent No. 4,342,462	08/03/1982	Carlesimo/ Adjustable Seal Member for Conduit to Manhole Junction
U.S. Patent No. 4,535,998	08/20/1985	Katz/ Sealing Device for Hydraulic Energy Dissipator of the Telescopic Type
U.S. Patent No. 4,570,943	02/18/1986	Houseman/ Sealing Flashing for Buildings with Interlocking Ring Members
U.S. Patent No. 4,574,548	03/11/1986	Tupman/ Column Reglet
U.S. Patent No. 4,664,390	05/12/1987	Houseman/ Weather Seal Device for Conduit Extending through Ridge Surface
U.S. Patent No. 4,673,034	06/16/1987	Hansen/ Cased Water Wells Having Flexible Pad
U.S. Patent No. 4,676,513	06/30/1987	Tiegs/ One-Piece Split Boot for Universal Joint
U.S. Patent No. 4,730,421	03/15/1988	Leeland/ Pitch Box
U.S. Patent No. 4,937,991	07/03/1990	Orth/ Flashing Unit for Sealing Roof Penetrations
U.S. Patent No. 5,067,291	11/26/1991	Evensen/ Pass-Through Roof Seal System
U.S. Patent No. 5,176,408	01/05/1993	Pedersen/ Seal Device for Pipes Passing Through Roof Structures
U.S. Patent No. 5,826,919	10/27/1998	Bravo/ Flexible Penetration Fitting
U.S. Patent No. 5,988,698	11/23/1999	Bravo/ Flexible Penetration Fitting
U.S. Patent No. 6,353,184	03/05/2002	Daoud/ Low Profile Adapter for Variable Size Heat Shrink Tubing Joint
U.S. Patent No. 6,362,427	03/26/2002	Daoud/ Low Profile Adapter for Variable Size Tubing
U.S. Patent No. 6,591,561	07/15/2003	Evensen/ Waterproof Roof Deck Post Construction
U.S. Patent No. 6,640,503	11/04/2003	Evensen/ Waterproof Roof Deck Post Construction and Method
U.S. Patent No. 6,647,682	11/18/2003	Bishop/ Drain Pipe Connector

The submitted patents each support the functional nature of the proposed mark and configuration of the proposed mark for which registration is sought, and the absence of trademark subject matter and/or secondary meaning of the proposed mark.

AS Holdings, Inc.

Dated: June 29, 2009

By _____
Terence J. Linn
Matthew D. Kendall
Van Dyke, Gardner, Linn & Burkhart, LLP
2851 Charlevoix Drive SE, Suite 207
Grand Rapids, Michigan 49546
Attorneys for the Opposer AS Holdings, Inc.

United States Patent [19]

Resech

[11] **4,211,423**

[45] **Jul. 8, 1980**

[54] **ROOF SEAL DEVICE**

[75] Inventor: Raymond W. Resech, La Grange Park, Ill.

[73] Assignee: Portals Plus, Inc., La Grange Park, Ill.

[21] Appl. No.: 974,435

[22] Filed: Dec. 29, 1978

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 881,186, Feb. 27, 1978, abandoned.

[51] Int. Cl.² F16J 15/02; E04D 13/14

[52] U.S. Cl. ..... 277/212 FB; 285/4; 285/42; 277/1; 277/12

[58] Field of Search ..... 277/1, 12, 212 FB; 285/3, 4, 42–44

[56] References Cited

U.S. PATENT DOCUMENTS

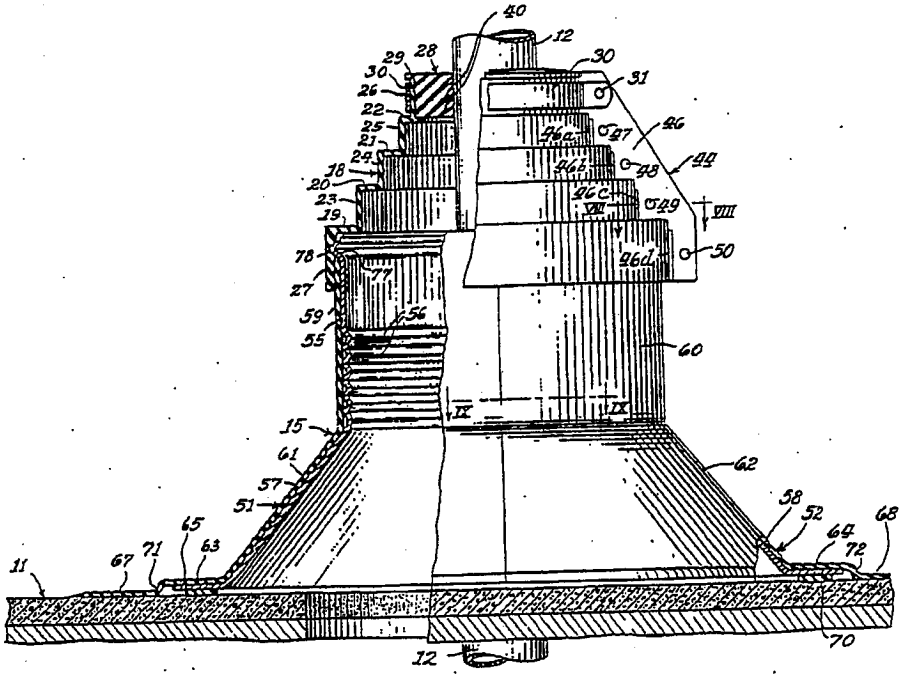
917,167	4/1909	Shaw	285/43
2,985,465	5/1961	Church	285/42
3,704,894	12/1972	Didszuhn	277/212 FB
3,807,110	4/1974	Kaminski	285/44 X
4,010,578	3/1977	Logsdon	285/44 X

Primary Examiner—Robert S. Ward, Jr.
Attorney, Agent, or Firm—John C. Brezina; Van Metre Lund

[57] ABSTRACT

A device is provided including a pair of base sections adapted to be joined together along a generally vertical plane in approximate alignment with a pipe or other object extending through a roof or supported therein, such sections including a pair of molded plastic-supporting parts and a pair of skirt parts of elastomeric material which have overlapping edge portions and which define a downwardly facing surface secured by an adhesive to the upper surface of roofing material to provide a permanent weathertight seal. A split boot is secured to the upper end of a tubular portion of the base sections and is of a stepped, severable construction for accommodating pipes or other objects of various larger sizes. Lips at the split of the boot are secured together by a channel-shaped metal clip. For smaller objects, a split plug is secured on the upper end of the split boot and has inwardly facing annular serrations for sealing engagement with an object. A multi-purpose adaptor plug is also provided for use with a variety of shapes, sizes and orientations of objects.

16 Claims, 14 Drawing Figures



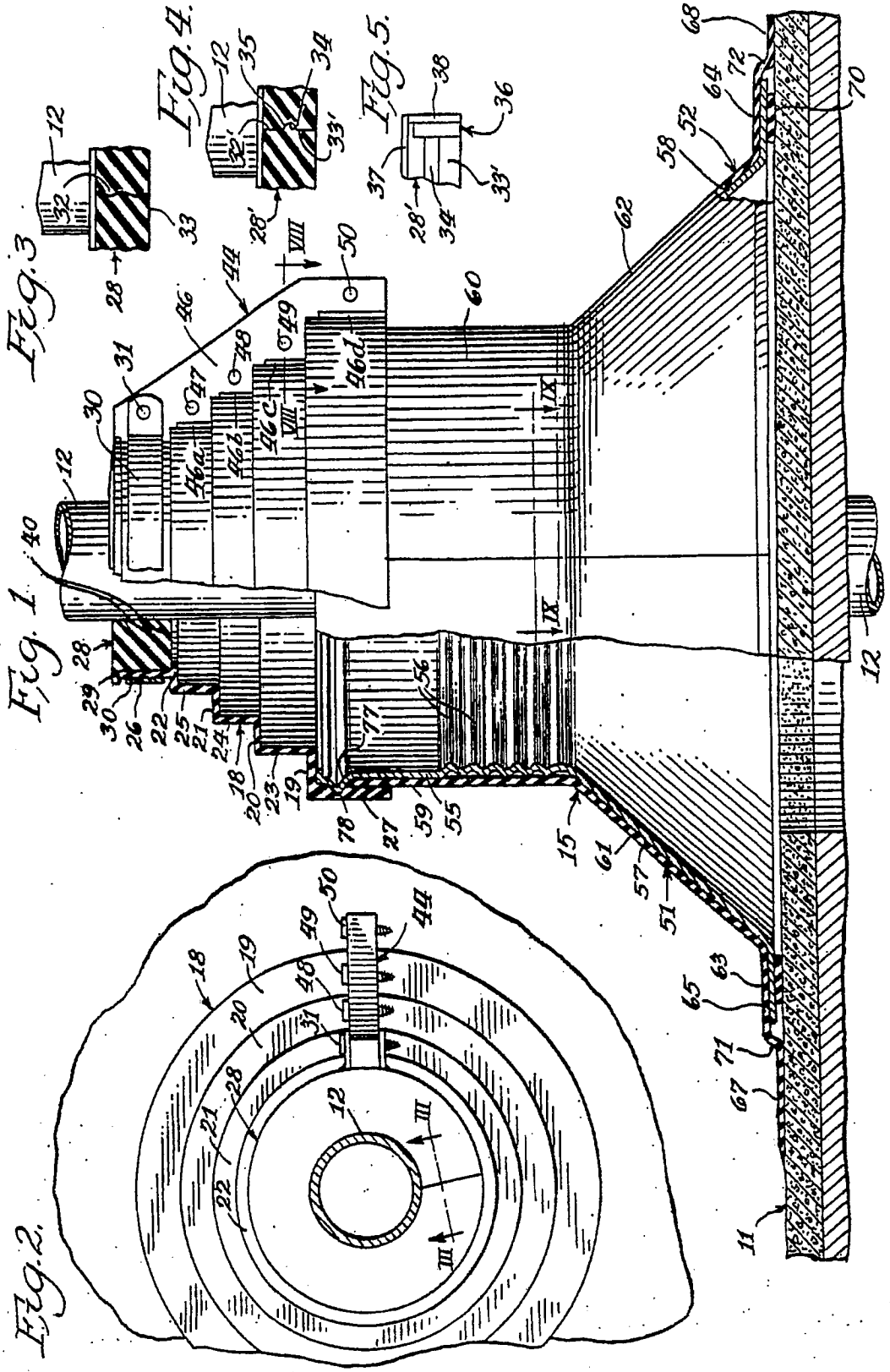


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

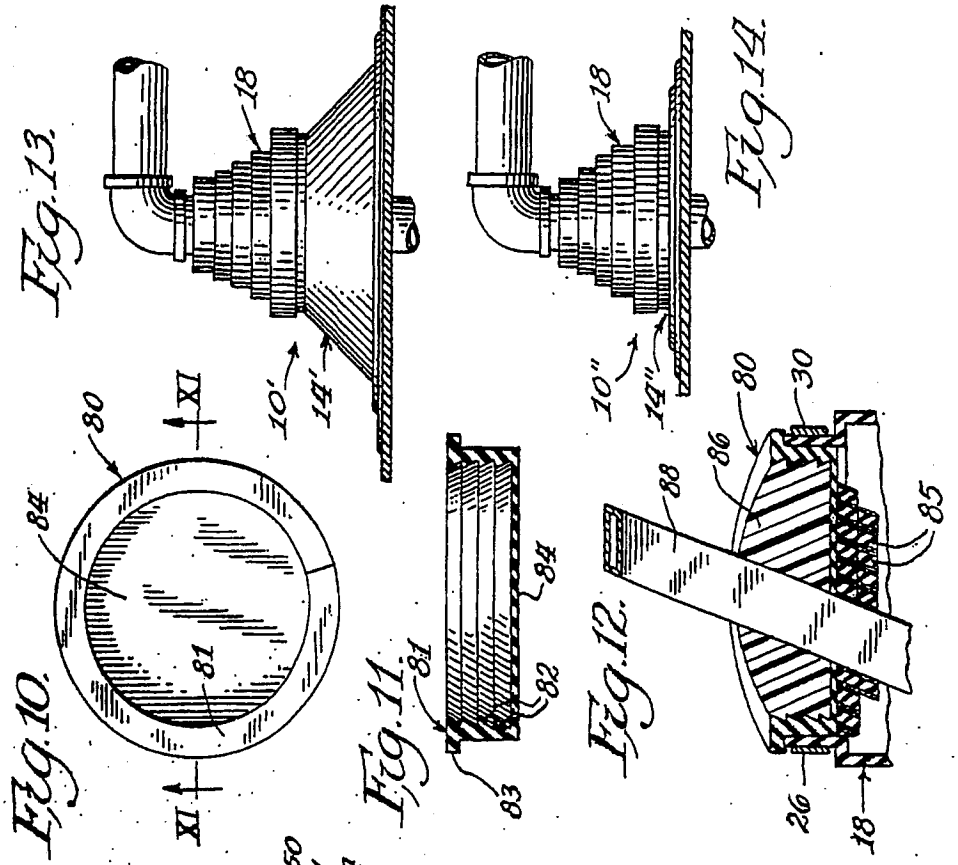


Fig.13.
18
10'
14'
Fig.14.
18
10"
14"
Fig.10.
80
84
81
XI
XI
Fig.11.
81
84
82
83
Fig.12.
88
86
80
30
85
26
18

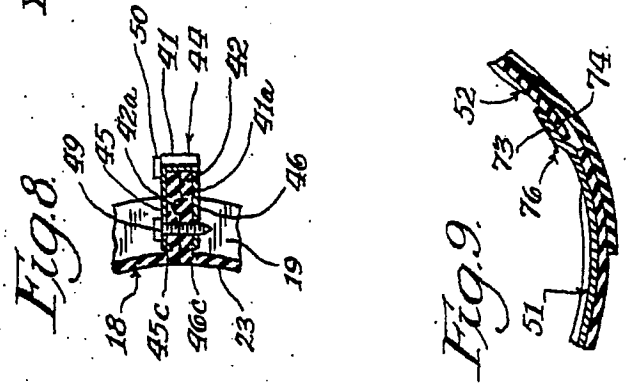


Fig.8.
50
41
44
42
42a
41a
49
45
46
18
45c
46c
23
19
Fig.9.
52
74
73
76
51

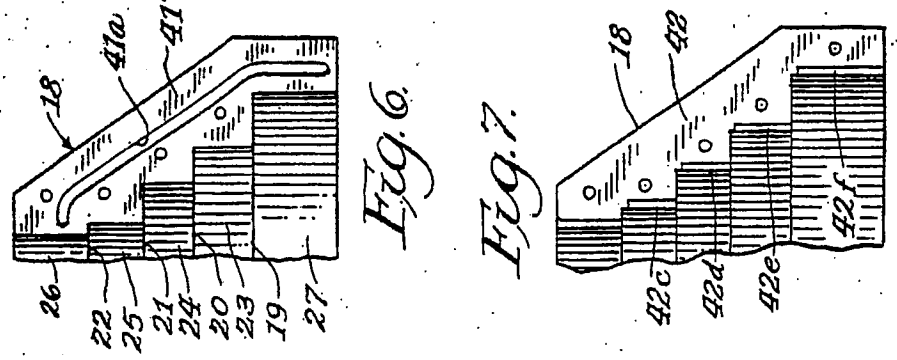


Fig.6.
18
41a
41'
26
22
25
21
24
20
23
19
27
Fig.7.
18
42
42c
42d
42e
42f

ROOF SEAL DEVICE

This application is a continuation-in-part of my copending application, Ser. No. 881,186, filed Feb. 27, 1978, now abandoned.

This invention relates to a roof seal device and more particularly to a device for providing a seal on a roof around a pipe or other object extending through a roof or supported therein. The device is adapted for use in extending pipes through existing roofs as well as in new constructions and is easily installed while providing a permanent weathertight seal.

BACKGROUND OF THE PRIOR ART

Under present roofing practices in which a pitch pocket is used to seal a pipe to a roof opening, leaks are quite common and there is a very high percentage of leaks within the first six months after installation. Sealants crack or run off because of ever-changing weather conditions. Pipe and roofing materials expand and contract with temperature changes and there are also relative movements such as vibrations from wind and/or machinery. If oftentimes happens that leaks are not discovered until after substantial damage has occurred, making major repairs necessary.

Roof curb devices have been provided for obtaining a proper seal but have generally be designed for new construction or during installation of a new roof and they are difficult to install and not at all suitable for extending a pipe through an existing roof.

SUMMARY OF THE INVENTION

This invention was evolved with the general object of overcoming the disadvantages of prior art sealing methods and devices and of providing a device which will provide a permanent weatherproof seal and which is readily installed in both existing and new construction.

In accordance with this invention, a pair of complementary base sections are provided, each including a support part of a molded, strong and substantially rigid plastic material and a skirt part of a flexible elastomeric material on the support part. The sections are arranged to be secured together along a generally vertical plane through a roof opening and together they provide an upstanding tubular portion and a peripheral flange portion with the skirt parts providing a downwardly facing surface engageable with the upper surface of roofing material about a pipe or other object extending through a roof or supported therein. An adhesive material bonds such engaging surfaces together and a permanent weatertight seal is provided.

The flexibility of the skirt parts promotes conformity to irregularities in the upper surface of the roofing material and also allows for relative expansions and contractions such as those due to temperature changes. Preferably and in accordance with a specific feature, the skirt parts are formed with offsets in a manner such as to provide an annular wall portion outside the periphery of the support parts, for additional flexibility.

Another specific feature relates to the provision of sections of adhesive material on the undersides of the edges of the support parts for holding the skirt parts on the roof during application of an adhesive between the peripheries of the skirt parts and the roof surface.

Seal means are secured to the upper end of the upstanding tubular portion defined by the base sections, preferably including a split boot of flexible elastomeric material which is most preferably of a stepped, severable construction for accommodating pipes or other cylindrical objects of various larger sizes. For objects of smaller sizes, a split annular plug is secured on the upper end of the boot, the plug having an opening of a size matched to that of the small object to be sealed and serrated tooth formations are provided in such opening.

Important features of the invention relate to the construction of the split boot and to the manner of installing the boot on the base sections. A pair of lip portions are provided at the split of the boot and are pressed together by a clip of generally channel-shaped configuration which is preferably formed with notches to conform to the stepped configuration of the boot and which is severable according to the size of the pipe.

In accordance with a specific feature, the clip is formed with tooth portions which bite into grooves in the lip portions in a manner and as to insure a highly reliable sealed connection.

Additional features relate to the construction of the plug which includes an outwardly extending annular flange or in an alternate construction, it includes a downwardly facing annular groove receiving an uppermost tubular portion of the stepped boot with tongue and groove means and overhanging flap means being provided at the split of the plug.

Another very important feature relates to a multipurpose adaptor plug which is so arranged as to receive a mastic and to provide a seal around an object or a plurality of objects of a variety of configurations. It may be used for example, for a plurality of pipes, one or more angle irons or for square tubes, objects extending at angles, etc.

Still another feature relates to the provision of annular ribs on the inside of the tubular portion of the base for engagement with the outside of a sheet metal chimney which may be nailed to a roof in new constructions. The device is thus suitable for installation during new construction as well as on existing roofs and can accommodate pipes of a wide range of sizes. It should be understood that the device can be used in conjunction with any elongated object similar to a pipe and the term "pipe" is used herein in a generic sense to include any equivalent type of object.

This invention contemplates other objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in section, illustrating a device constructed according to the invention installed on a roof to provide a seal to a pipe;

FIG. 2 is a top plan view of the device;

FIG. 3 is a sectional view taken substantially along line III—III of FIG. 2 and showing an interface at the split of a plug of the device;

FIG. 4 is a view similar to FIG. 3, showing an alternative construction;

FIG. 5 is a view of one face of the split of the alternative plug construction of FIG. 4;

FIG. 6 is a view illustrating an inner face of one lip portion of a split boot of the device;

FIG. 7 is a view illustrating an outer face of a second lip portion of the split boot of the device;

FIG. 8 is a sectional view taken substantially along line VIII—VIII of FIG. 1.

FIG. 9 is a sectional view taken substantially along line IX—IX of FIG. 1.

FIG. 10 is a top plan view of a multi-purpose adaptor plug according to the invention;

FIG. 11 is a sectional view taken substantially along line XI—XI of FIG. 10;

FIG. 12 is a perspective view, partly in section, illustrating how the adaptor plug of FIGS. 10 and 11 is used and installed;

FIG. 13 is a side elevational view illustrating a modified base configuration which has an intermediate height profile; and

FIG. 14 is a side elevational view illustrating another modified base configuration which has a low profile.

DESCRIPTION OF A PREFERRED EMBODIMENT

Reference numeral 10 generally designates a roof seal device constructed in accordance with the principles of this invention, and shown installed on a roof 11 to provide a seal to a pipe 12 which extends through an opening 13 in the roof 11. The device 10 is designed for installation on an existing roof to replace a defective seal or for installation on an existing roof after extending a pipe through a new opening cut therethrough. It may be used for objects other than pipes, for objects which project upwardly from a roof without extending therethrough. It may also be used in new construction as hereinafter described. Once installed, it provides a permanent waterproof seal.

The device 10 comprises a base generally designated by reference numeral 14 and including a pair of complementary base sections 15 and 16 which are adapted to be joined together along a generally vertical plane in approximate alignment with an object projecting upwardly from a roof, the plane being through the roof opening 13 in the illustrated arrangement. Sections 15 and 16 together provide an upstanding generally tubular portion and a peripheral portion for engagement with the roof surface about the opening therein. Pipe seal means are secured to the upper end of the base and include a split boot 18 of a flexible elastomeric material which preferably has a plurality of annular step portions 19–22 in vertically spaced planes and tubular portions 23–26 progressively smaller diameters joining the inner edge of each of the step portions and the outer edge of the next higher step portion. An additional tubular portion 27 extends around the upper end of the base. The boot 18 is severable along the top edge of a selected one of the tubular portions 23–27 which has a diameter matching that of a pipe within a larger size range, such as from 3½ to 6 inch pipe, for example. For smaller sizes of pipe, a split annular plug 28 is provided.

The plug 28 has an outwardly projecting annular flange 29 which overlies the uppermost tubular portion 26 of the boot 18 and a clamp 30 is disposed around the tubular wall portion 26, a screw 31 being extended through the ends of the clamp 30. As shown in FIGS. 2 and 3, the split of the plug 28 provides two interengaging faces 32 and 33 which are formed on a bias, i.e. at an angle to a radial plane and which are of mating form with alternating grooves and ridges.

In the alternative as shown in FIGS. 4 and 5 a modified plug 28' may be used including a face 32' having a groove 34 receiving a tongue 35 on a face 33'. The modified plug 28' may be formed with a downwardly facing annular groove 36 which receives the uppermost tubular portion 26 of the boot 18, within the clamp. An integral flap portion 37 projects from the upper side of the face 33' and overlies a portion of the plug 28', adjacent the face 32'. In addition, a flap portion 38 is provided on the outside projecting from the outer side of the face 33' and on the outside of a portion of the plug adjacent the face 32'.

Another feature of the plug 28 is in the provision of annular serrations 40 in the central opening of the plug for engagement with the outside surface of the pipe and to improve the sealing action. The serrations are formed by downwardly facing annular surfaces which are at relatively large angles relative to the horizontal and upwardly facing surfaces which are horizontal or at relatively small angles to the horizontal.

It should be noted that the pipe 12 as illustrated is a conventional pipe, but the plug 28 can be used for other types of objects such as angle and channel-shaped members, for example, and the opening in the plug can be shaped as desired or a multi-purpose plug can be used as hereinafter described in connection with FIGS. 10–12. Also, of course, the openings for pipes should have a size corresponding to the outer diameter of the pipe, and, for example, a plurality of plugs may be supplied for pipe sizes of three inches, two and one-half inches, two inches, one and one-half inches, one and one-quarter inches, one inch, three-quarter inch, one-half inch and three-eights inch. The upper face of the plug, as shown, should have a slight pitch.

The boot 18 at the split therein includes a pair of outwardly projecting interengaging lip portions 41 and 42, the portion 41 having a groove 41*a* therein which receives an integral tongue 42*a* formed on the lip 42. The lips 41 and 42 are secured together by a generally channel-shaped clip 44 including side walls 45 and 46 which are formed with notches which register with each other and with the projections formed by the step and tubular portions of the boot. The screw 31, which secures the clamp 30 in place, may also extend through the upper ends of the side walls of the clip 44 and additional screws 47, 48, 49 and 50 have shank portions extended through openings in side wall 45 thence through openings in the lips 41 and 42 and thence into openings in the side wall 46.

An additional feature of the clip 44 is in the provision turned-in portions 45*a*, 45*b*, 45*c* and 45*d* on wall 45 and turned-in portions 46*a*, 46*b*, 46*c* and 46*d* on wall 46 which form teeth engaged in notches in the lip portions 41 and 42. Thus as illustrated in FIG. 7, the outer face of the lip portion 42 is formed with grooves 42*c*, 42*d*, 42*e* and 42*f* receiving the teeth 46*a*, 46*b*, 46*c* and 46*d* and the lip portion 41 is formed with similar grooves receiving the teeth 45*a*–45*d*.

When the boot 18 is severed for use with a larger size of pipe, the clip 44 is correspondingly severed.

The base sections 15 and 16 include supporting parts 51 and 52 which are of molded, strong and substantially rigid plastic material, preferably an acrylonitrite butadiene styrene material, and skirt parts 53 and 54 of a flexible elastomeric material, preferably an ethylene propylene hydrocarbon material. A portion 55 of the supporting part 51 and a corresponding portion of the other supporting part 52 together provide a generally tubular portion of the base and such portions are preferably formed to provide annular rib formations 56 which are provided for engagement with the outside surface of a chimney which may preferably be formed of sheet metal and secured to a roof opening, such being used in new construction. For use on existing construction, the

rib formations 56 do not engage such a chimney device but they are nevertheless advantageous in reinforcing and rigidifying the supporting parts 51 and 52.

The supporting part 51 further includes a portion 57 which together with a corresponding portion 58 of the other supporting part 52 provide a generally frusto-conical support portion.

The skirt parts 53 and 54 include portions 59 and 60 which together define a generally tubular portion surrounding the tubular portion formed by portion 55 of the supporting part 51 and the corresponding portion of supporting part 52. The skirt parts 53 and 54 further include frusto-conical portions 61 and 62 disposed on the outside of portion 57 of part 51 and the corresponding portion 58 of part 52.

In addition, the skirt parts 53 and 54 include portions 63 and 64 disposed against the upper surfaces of outwardly projecting annular flange portions 65 and 66 and parts 51 and 52.

On the outside of the portions 63 and 64, the skirt parts 53 and 54 include peripheral portions 67 and 68 which are bonded to the upper surface of the roof 11 through a suitable adhesive. Prior to installation, an adhesive strip 69 is secured to the underside of the peripheral flange portion 65 of the supporting part 51 and a corresponding adhesive strip 70 is secured to the underside of the corresponding flange portion 66 of the part 52, such adhesive strips being protected by a suitable release paper which is removed prior to installation so that the device can be accurately positioned on the roof, after which the adhesive is supplied between the lower surfaces of portions 67 and 68 of the skirt parts 53 and 54 and the upper surface portions of the roof.

An important feature is in the provision of wall portions 71 and 72 between the portions 63,64 and 67,68 which provide an offset to accommodate the thicknesses of the flange portion 65 and adhesive strip 69 and the corresponding flange portion and adhesive strip on the opposite side. The portions 71 and 72 are also very important in permitting a flexibility such as to accommodate shifts in position as encountered in the extreme temperature and other environmental conditions to which roof structures are subjected.

FIG. 9 shows how edge portions of the two base sections 15 and 16 are secured together. On one side, the supporting part 51 of base section 15 has an edge portion 73 which is offset radially inwardly to extend on the inside of an edge portion 74 of the supporting part 52 of the base section 16. Such edge portions are secured together through a plurality of metal clips one of which is designated by reference numeral 76 in FIG. 9. The clip 76 is of generally S-shaped configuration and the edge portion 73 is lockeld between inner and intermediate portions thereof while edge portion 74 is locked between intermediate and outer portions thereof, such inner, intermediate and outer portions being preferably formed with integral struck-out tooth portions for biting and locking engagement with the edge portions 73 and 74. The same arrangement is used on the other side but with the edge portion of the supporting part 52 being offset inwardly to extend on the inside of the supporting part 51, the supporting parts 51 and 52 thus having the same configuration. Preferably, at least three metal clips are used on each side, one adjacent the top of the generally cylindrical portion of the base, another adjacent the junction between the cylindrical and frusto-conical portions and a third adjacent the lower and outer end of the frusto-conical portion. Prior to assembly each supporting part may carry clips along the edge portion at one side thereof, in position to receive the mating edge portion of the other supporting part.

As shown in FIG. 1, the lowermost tubular portion 27 of the boot 18 has an inwardly facing annular groove 77 which receives an outwardly projecting annular rib or tongue portion 78 of the supporting part 51, a similar annular rib or tongue portion being provided on the other supporting part 52.

When the device is used in connection with extending pipes through or in mounting an object on an existing roof, or in replacing defecting seals around pipes or other objects, the device is preferably provided with the adhesive strips 69 and 70 and with strips of a protective release paper on the undersides of such adhesive strips. As a preliminary step, the roof surface around a pipe or other object to be sealed is prepared to provide a smooth and firm surface with gravel and dirt being swept away in all directions by means of a brush which may be desirable supplied with the device. Also, the two base sections are brought together around the pipe or other object, the edge portions of the supporting parts 51 and 52 being locked together through the clips 76 as above described. Then after removing the strips of release paper from the undersides of the adhesive strips 69 and 70, the base is carefully centered relative to the pipe or other object and is pressed down against the roof, preferably by stepping down on the portions 63 and 64, the adhesive strips 69 and 70 being then effective to securely hold the base in the proper position relative to the pipe or other projecting object.

After so mounting the base, the installer lifts an extending side flap portion of each of the skirt parts 53 and 54 which overlaps a side edge of the other and applies an adhesive between such flap and side edge portion, firmly pressing them together to provide a reliable seal. The user also lifts the peripheral edge portions 67 and 68 of the skirt parts 53 and 54, applies an adhesive between the undersides of such edge portions and the roof surface portions therebelow and then presses the portions 67 and 68 against the roof surface portions to provide a reliable seal.

The boot 18 is then installed and, if desired, an adhesive is applied between interengaging surfaces of the lip portions 41 and 42 after which the clip 44 is installed with the screws 47–50 being inserted and tightened to firmly clamp the lip portions 41 and 42 together.

If the device is used with a pipe or other cylindrical object having a diameter greater than that corresponding to the upper tubular portion 26 of the boot 18, the boot 18 is cut at the upper edge of the appropriate one of the tubular portions 23–25 prior to installation, the clip 44 is also cut at a corresponding level and a clamp similar to clamp 30 is installed around such tubular portion.

If the device is used with a pipe or other cylindrical object having a diameter corresponding to the upper tubular portion 26, the clamp 30 is used to clamp the portion 26 directly to the pipe or other object.

If the device is used with a pipe or other object having a size less than that corresponding to the upper tubular portion 26, the plug 28 is used, being installed in a position as shown after which the clamp 30 is installed with the screw being tightened.

It is noted that the plug 28 may be formed with a central opening having a shape such as to receive projecting objects which do not have cylindrical shapes,

such as square objects, angle irons, etc. It is also possible to use a multi-purpose adaptor plug arrangement as illustrated in FIGS. 10–12, forming an important feature of the invention. An adaptor plug 80 is provided including a split annular wall portion 81 having an outside cylindrical surface engageable with the inner surface of the uppermost tubular portion 26 of the boot 18 and having an internal surface formed with serrations 82 similar to the serrations 40 of the plug 28. An integral projecting annular flange 83 is provided, similar to the flange 29 of the plug 28 and for the same purpose.

The adaptor plug 80 additionally has a bottom 84 which may preferably be quite thin. In use, the plug 80 is positioned on the top of the boot 18 and the bottom 84 is cut, with a razor blade for example, to an extent necessary to permit the plug to be fully inserted in the upper end of the boot 18 and around one or more pipes or other projecting objects. After marking the position of the bottom 84 relative to the projecting object or objects, the plug is temporarily removed and, as shown in FIG. 12, a special thick adhesive tape 85 is wrapped around the projecting object or objects at a level such as to provide support for the bottom 84 when the plug 80 is then reinserted in the boot. Next a mastic 86 is applied into the plug to fill the space around the projecting object or objects and within the annular wall portion 81.

In FIG. 12, the projecting object is shown as being a square tube 86 extending at an angle but it will be understood that the arrangement can be used with a wide variety of shapes, orientations and members of projecting objects. It is also noted that the plug 80 is not limited to use in connection with a split boot and split base arrangement as illustrated but may be used with non-split boots as in new construction, for example.

It is noted that the roof seal device 10 as illustrated in FIG. 1 has what may be described as a high height profile which is desirable for most applications but a modified device 10', FIG. 13, having an intermediate height profile may be used in some applications and another modified device 10", FIG. 14, having a low height profile may be used in other applications. Device 10" may be used, for example, in providing a seal around a pipe which projects to an elbow only a short distance above the level of a roof.

In all three devices 10, 10' and 10" the size of the boot 18 is the same and it projects just slightly less than 4 inches above the top of the curb or base 14, 14' or 14". In FIG. 1 the height of the curb or base 14 is 8 inches; in FIG. 13, the height of the base 14' is 5 inches; and in FIG. 14, the height of the base 14" is only 1½ inches. In both FIGS. 1 and 13, the overall diameter, including the skirt flange portions 67 and 68 is 20.5 inches and in the low profile base 14" of FIG. 14 it is reduced to 13.625 inches it being noted that the low profile base has no frusto-conical portion. These dimensions are given by way of illustrative example and are not to be construed as limitations except that dimensions and proportions of the same order as described and illustrated are of some importance for obtaining optimum use and performance of the devices.

It is noted that in new construction, the base sections may be secured together prior to use and a sheet metal chimney may be nailed to the new roof about an opening therein after which the base may be inserted on the chimney so secured in position. The device is thus extremely versatile, being usable for both existing and new constructions and being adapted to receive pipes or other objects of a wide variety of sizes and configurations.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a device for providing a weather-tight seal on a roof around an object projecting upwardly therefrom, a pair of complementary base sections adapted to be joined together along a generally vertical plane in approximate alignment with said object and together providing an upstanding generally tubular portion for surrounding the object and a peripheral flange portion extending outwardly from the lower end of said tubular portion for engaging the upper surface of roofing material about said object, seal means secured to the upper end of said tubular portion for sealing engagement with said object, each of said complementary base sections including a supporting part of a molded, strong and substantially rigid plastic material and a skirt part of a flexible elastomeric material on said support part, each of said skirt parts having edge portions arranged for overlapping interfitting engagement with edge portions of the skirt part of the other section, said skirt parts having peripheral edge portions together providing a downwardly facing surface adapted to engage an annular portion of the upper surface of roofing material about said object, and an adhesive material for sealing and bonding said downwardly facing surface of said skirt parts to said upper surface of said roofing material.

2. In a device as defined in claim 1, said skirt parts being formed of an ethylene propylene hydrocarbon material adapted to withstand temperatures varying over a wide range and adapted to be sealingly secured through said adhesive to the upper surfaces of roofs including both tarred and shingled roofs.

3. In a device as defined in claim 2, said supporting parts being of an acrylonitrite butadiene styrene material.

4. In a device as defined in claim 1, said pipe seal means including a split boot of a flexible elastomeric material for accommodating relative movements of the pipe and roof due to expansion and contraction from heat and cold and to vibrations.

5. In a device as defined in claim 4, said split boot having a pair of engagable lip portions along the split thereof, and a generally channel-shaped metal closure clip arranged to be pressed into said engagable lip portions to press said lip portions together and to provide mechanical support therefor.

6. In a device as defined in claim 4 for use with a cylindrical object, said split boot having a plurality of annular step portions in vertically spaced planes and tubular portions of progressively smaller diameters joining the inner edge of each step portion and the outer edge of the next higher step portion, said boot being severable along the top edge of a selected tubular portion having a diameter matching that of said object.

7. In a device as defined in claim 6, said split boot having a pair of engagable lip portions along the split thereof, and a generally channel-shaped metal closure clip arranged to be pressed onto said engagable lip portions to press said lip portions together and to provide mechanical support therefor, said clip being severable to match the severence of said boot in matching the diameter of said object.

8. In a device as defined in claim 7, said clip including parallel side walls having registering notches for receiv-

ing and interfitting with said step and tubular portions and being severable at the bottom of each notch.

9. In a device as defined in claim 6, a split annular plug defining a central opening for receiving an object having a transverse dimension less than the diameter of the smallest diameter upper end tubular portion of said boot.

10. In a device as defined in claim 9, said split plug having a downwardly facing annular groove receiving said upper end tubular portion of said boot, having at the split thereof mating radially extending tongue and groove means and overhanging flap means, and having inwardly facing annular serrations in said opening for sealing engagement with the object.

11. In a device as defined in claim 8, said clip having pairs of opposed tooth portions adapted to bite into said lip portions adjacent the outer surfaces of said tubular portions.

12. In a device as defined in claim 1, said supporting parts having outwardly extending peripheral edge portions, adhesive means on the underside of said outwardly extending peripheral edge portion of said supporting parts for securing said supporting parts to said roof, said peripheral edge portions of said skirt parts extending outwardly beyond said peripheral edge portions of said supporting parts for providing said downwardly facing surface of said skirt parts.

13. In a device as defined in claim 12, said skirt parts having portions together defining an annular wall projecting upwardly from inner edges of said peripheral edge portions of said skirt parts on the outside of said peripheral edge portions of said supporting parts.

14. In a device as defined in claim 1, said seal means including a plug having a split annular wall adapted to encircle an object and having a relatively thin bottom wall adapted to be cut for extension of the object therethrough, said plug being adapted to be filled with a mastic material.

15. In a device for providing a weather-tight seal on a roof about an object projecting upwardly therefrom, seal means for providing a seal between the object and the upper end of a tubular portion which surrounds the object, said seal means including a plug having a split annular wall adapted to encircle an object and having a relatively thin bottom wall adapted to be cut for extension of the object therethrough, said plug being adapted to be filled with a mastic material.

16. In a device as defined in claim 15, adhesive tape means adapted to be wrapped around the object below said bottom for support of said bottom during filling of said plug with a mastic material.

* * * * *

United States Patent [19]

Houseman

[11] **Des. 269,454**

[45] ** **Jun. 21, 1983**

[54] **SEAL FOR A ROOF VENT PIPE OR SIMILAR ARTICLE**

[75] Inventor: **David G. Houseman, Bayswater, Australia**

[73] Assignee: **John Deks Australia Pty., Ltd., Baywater, Australia**

[**] Term: **14 Years**

[21] Appl. No.: **228,955**

[22] Filed: **Jan. 27, 1981**

[30] **Foreign Application Priority Data**

Jul. 28, 1980 [AU] Australia 81,633

[51] **Int. Cl.** ..... **D23—01**
[52] **U.S. Cl.** **D23/42**
[58] **Field of Search** D23/40–47; 277/9; 52/60; 285/3, 4, 42, 43, 44, 58, 59, 60, 199

[56] **References Cited**

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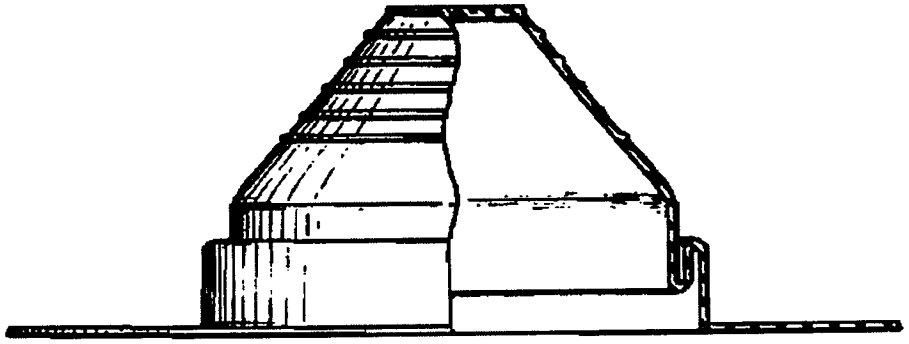
Primary Examiner—Robert C. Spangler
Attorney, Agent, or Firm—Bucknam and Archer

[57] **CLAIM**

The ornamental design for a seal for a roof vent pipe or similar article, as shown and described.

DESCRIPTION

FIG. 1 is a top plan view of a seal for a roof vent pipe or similar article showing my new design;
FIG. 2 is a side elevational view partially in section;
FIG. 3 is a perspective view; and
FIG. 4 is a bottom plan view.



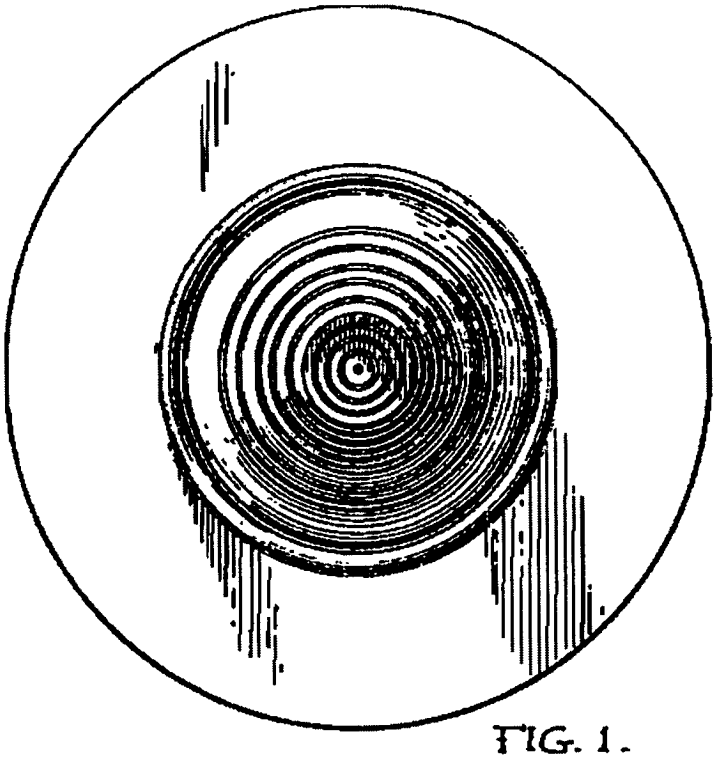


FIG. 1.

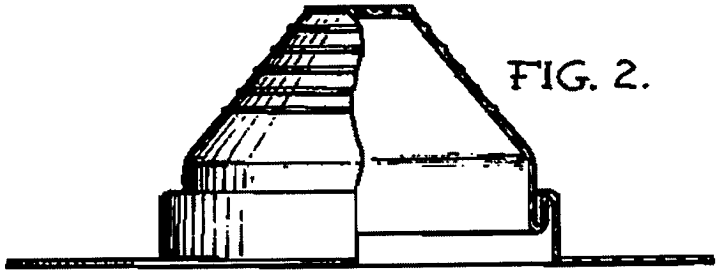


FIG. 2.

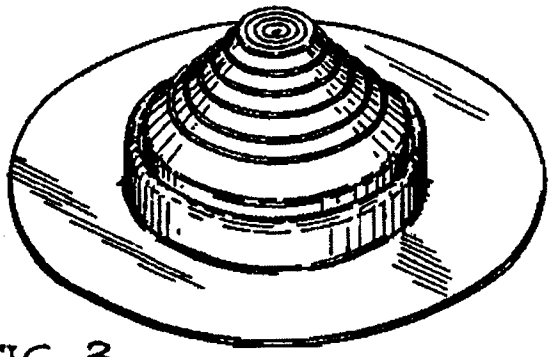


FIG. 3.

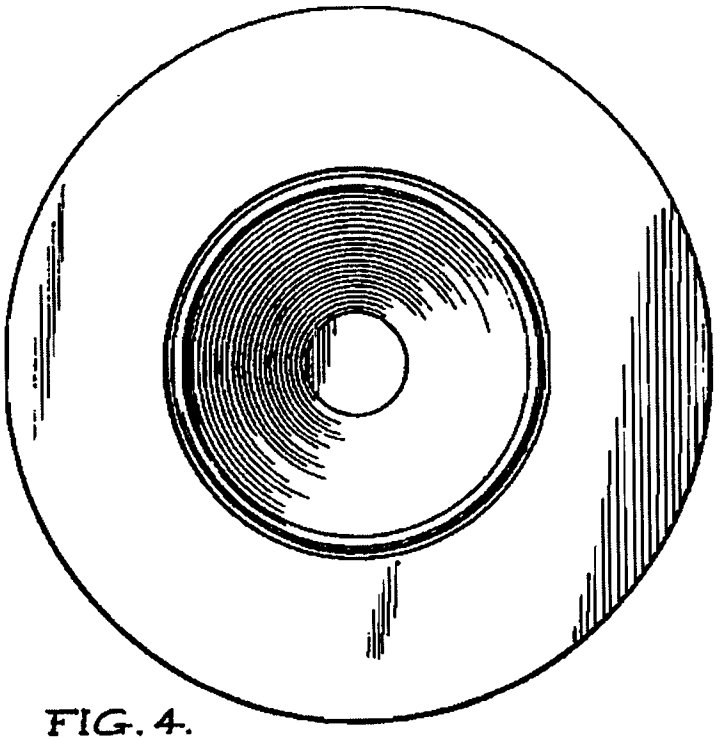


FIG. 4.

United States Patent [19]

Eriksson

[11] **Patent Number: Des. 287,872**

[45] **Date of Patent: ** Jan. 20, 1987**

[54] **SEALING DEVICE FOR SURROUNDING THE POINT OF EMERGENCE OF A PIPE FROM A WALL OR FLOOR**

[75] Inventor: **Stellan Eriksson**, Sollebrunn, Sweden

[73] Assignee: **Indoor Innovation Aktiebolag**, Ludvika, Sweden

[**] Term: **14 Years**

[21] Appl. No.: **557,526**

[22] Filed: **Dec. 2, 1983**

[52] U.S. Cl. D23/40

[58] Field of Search D23/40; 285/13, 42, 285/46, 178, 93; 73/323; D8/384, 385

[56] **References Cited**

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Townsend Fastening Systems Catalogue, p. 1, item "A".

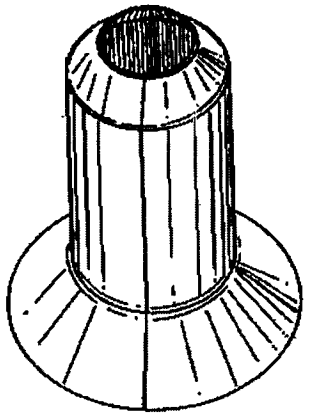
Primary Examiner—Wallace R. Burke
Assistant Examiner—Brian N. Vinson
Attorney, Agent, or Firm—Young & Thompson

[57] **CLAIM**

The ornamental design for a sealing apparatus for surrounding the point of emergence of a pipe from a wall or floor, as shown and described.

DESCRIPTION

FIG. 1 is a top perspective view of a sealing apparatus for surrounding the point of emergence of a pipe from a wall or floor showing my new design;
FIG. 2 is a bottom perspective view thereof;
FIG. 3 is a front elevational view of a portion of the apparatus, the opposite portion being omitted for ease of illustration;
FIG. 4 is a rear elevational view thereof;
FIG. 5 is a side elevational view thereof.
The two halves constituting the assembled device shown in FIGS. 1 and 2, one of which is shown in FIGS. 3-6, are identical to each other.



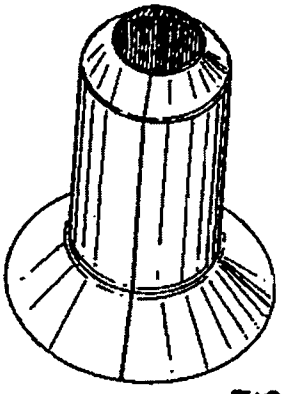


FIG.1

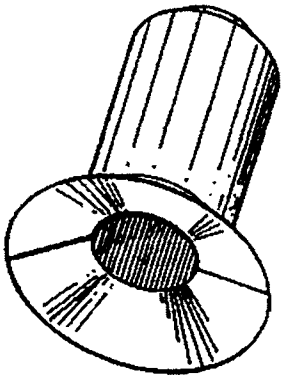


FIG. 2

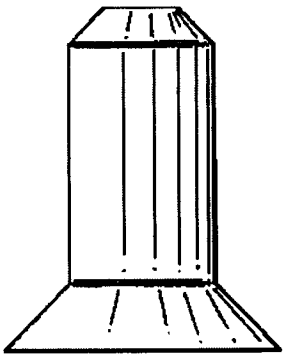


FIG. 3

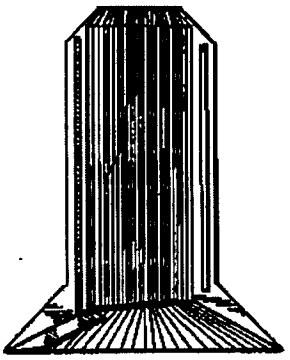


FIG. 4

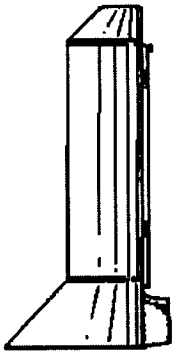


FIG. 5

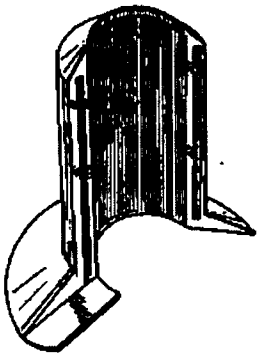


FIG. 6

F. E. SHAW.

ROOF FLASHING.

APPLICATION FILED FEB. 17, 1908.

917,167. Patented Apr. 6, 1909.

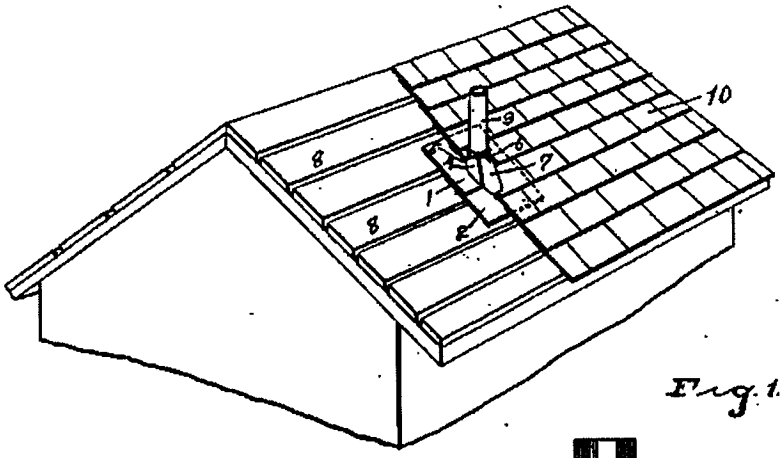


Fig. 1.

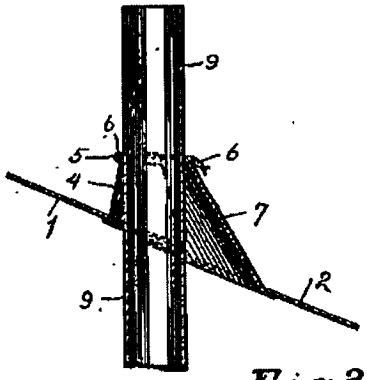


Fig. 2.

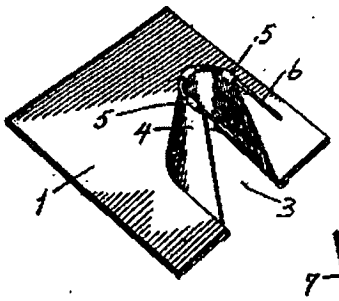


Fig. 3.

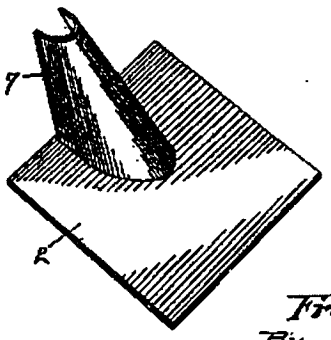


Fig. 4.

Witnesses

Carl Stoughton

J. B. Adams

Inventor

Frank E. Shaw

By C. C. Shepherd

Attorney

UNITED STATES PATENT OFFICE.

FRANK E. SHAW, OF COLUMBUS, OHIO, ASSIGNOR OF ONE-HALF TO JOSEPH F. TREDWAY AND ONE-HALF TO WALTER KLIE, OF COLUMBUS, OHIO.

ROOF-FLASHING.

No. 917,167. Specification of Letters Patent. Patented April 6, 1909.

Application filed February 17, 1908. Serial No. 416,218.

To all whom it may concern:

Be it known that I, FRANK E. SHAW, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Roof-Flashing, of which the following is a specification.

My invention relates to the improvement of roof flashing of that class which is adapted to be employed on a building roof about pipes which pass through said roof and the objects of my invention are to provide a simple and inexpensive flashing of this class by means of which the interstices in a roof structure which ordinarily occur adjacent to the surface of a pipe passing through the roof, will be closed against the admission of water; to so construct my improved device as to admit of its being used on roofs of different inclinations and to produce other improvements which will be more fully pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawing, in which:

Figure 1 represents a building roof having my improved flashing in use thereon and showing for the sake of clearness in illustration a portion of the roofing slats broken away, Fig. 2 is a central vertical section through my device, and through a roof pipe about which said flashing is clamped, Fig. 3 is a view in perspective of one section of my improved flashing, and, Fig. 4 is a similar view of the remaining section.

Similar numerals refer to similar parts throughout the several views.

In carrying out my invention, I employ two metallic flashing plates 1 and 2. In the construction of what I will term the upper section of my device, I form in the outer and lower edge of the plate 1 an inwardly extending recess or pocket 3 which is rounded at its inner end. Rising from the upper face of the plate 1 about this recess is a half sleeve or shield section 4, this half shield or sleeve section inclining or tapering slightly toward its upper open end and having its parallel forward edge portions inclined rearwardly from the forward edge of the plate 1. Formed with the upper curved end of the shield section 4 at suitable intervals are outwardly and thence inwardly bent ears 5 forming wire supports or keepers through which passes the central portion of a binding or clamping wire. In forming the second and what I will term the lower section of my device, I provide the plate 2 with a recess in its upper edge, similar to the recess 3 of the plate 1 and rising from about this recess is a curved shield section 7, the latter being inclined outward over the mouth of the plate recess and also being tapered toward its upper end.

In utilizing my improved flashing, the plate section 2 is nailed or otherwise suitably secured to a roof frame such as is indicated at 8, so that the body of said plate is below a ventilating or other pipe 9 which extends through said roof frame and in such position that the inclined shield projection 7 has its outer curved end embracing a portion of the pipe 9. The plate 1 is then secured to the roof frame so that the major portion of said plate is above the pipe and the remainder on opposite sides thereof, the shield projection 4 of the plate 1 thus being made to embrace both that portion of the pipe which is not embraced by the end of the shield 7 and also to embrace or receive a portion of said shield 7. When the shield projection 7 of the plate 2, is thus partially telescoped within the shield projection 4, the lower portion of the plate 1 overlaps the upper portion of the plate 2. The plates being thus secured to the roof frame, the projecting end portions of the wire 6 which extend on opposite sides of the upper portion of the shield projection 7, are twisted together on the outer side of the upper end portion of said shield projection 7 until the upper curved ends of the shield projections are drawn into close weather-proof contact with the periphery of the pipe 9. This being accomplished, the roofing shingles which in the drawing are indicated at 10, are secured in the usual manner upon the framework and made to cover the exposed portions of the plates 1 and 2. Owing to the fact that the shield sections of the two plates are so shaped as to fit snugly one within the other and the further fact that the upper ends of said shield sections are by means of the twisted wire 6 drawn into close contact with the pipe, it will readily be understood that the tendency of rain to follow the pipe downward through the roof frame, will be obviated.

It will be understood that pipes of slightly varying sizes may be engaged in the man-

ner above described, by flashing sections of one size, but that in case the flashing is to be used in connection with unusually small or large pipes, said sections may be constructed of convenient sizes for such use. It will also be understood that a roof flashing such as I have described, may be readily employed on roofs of different inclinations inasmuch as the cheap metal of which the flashing projections are formed, is sufficiently pliable to admit of the upper ends of said flashing projections being drawn into proper engagement with the pipe.

What I claim, is:

In a roof flashing, the combination with a pair of base plates, of tapering sleeves rising from said plates, one of said sleeves being adapted to enter the other of said sleeves and one of said plates being adapted to overlap the other of said plates, said sleeves being adapted, when drawn together, to encircle a pipe, one of said sleeves overhanging the front edge of the plate by which it is carried and the edges of the other sleeve slanting away from the front edge of the plate by which it is carried in such manner that the joint between the said sleeves is not a vertical one, and means for drawing the upper edges of said sleeves into close contact with the pipe passing therethrough, said means comprising a wire and a plurality of integral ears bent outwardly from the upper edge of one of the sleeves and around the bight of said wire, the ends of said wire being twisted into engagement with each other to bind said sleeves about said pipe.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK E. SHAW.

Witnesses:

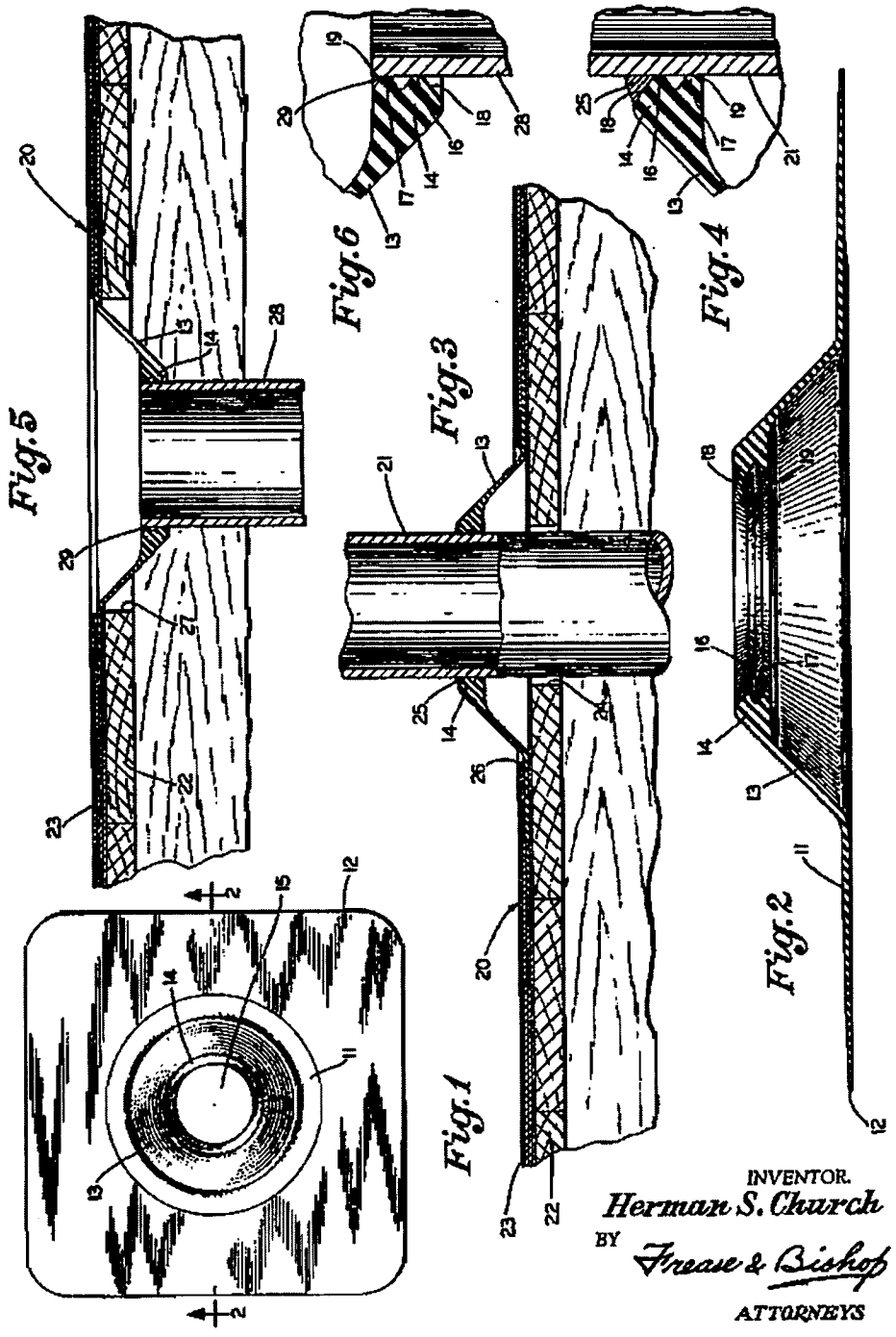
A. L. Phelps,

L. Carl Stoughton.

May 23, 1961 H. S. CHURCH 2,985,465

ROOF FLANGE CONSTRUCTION

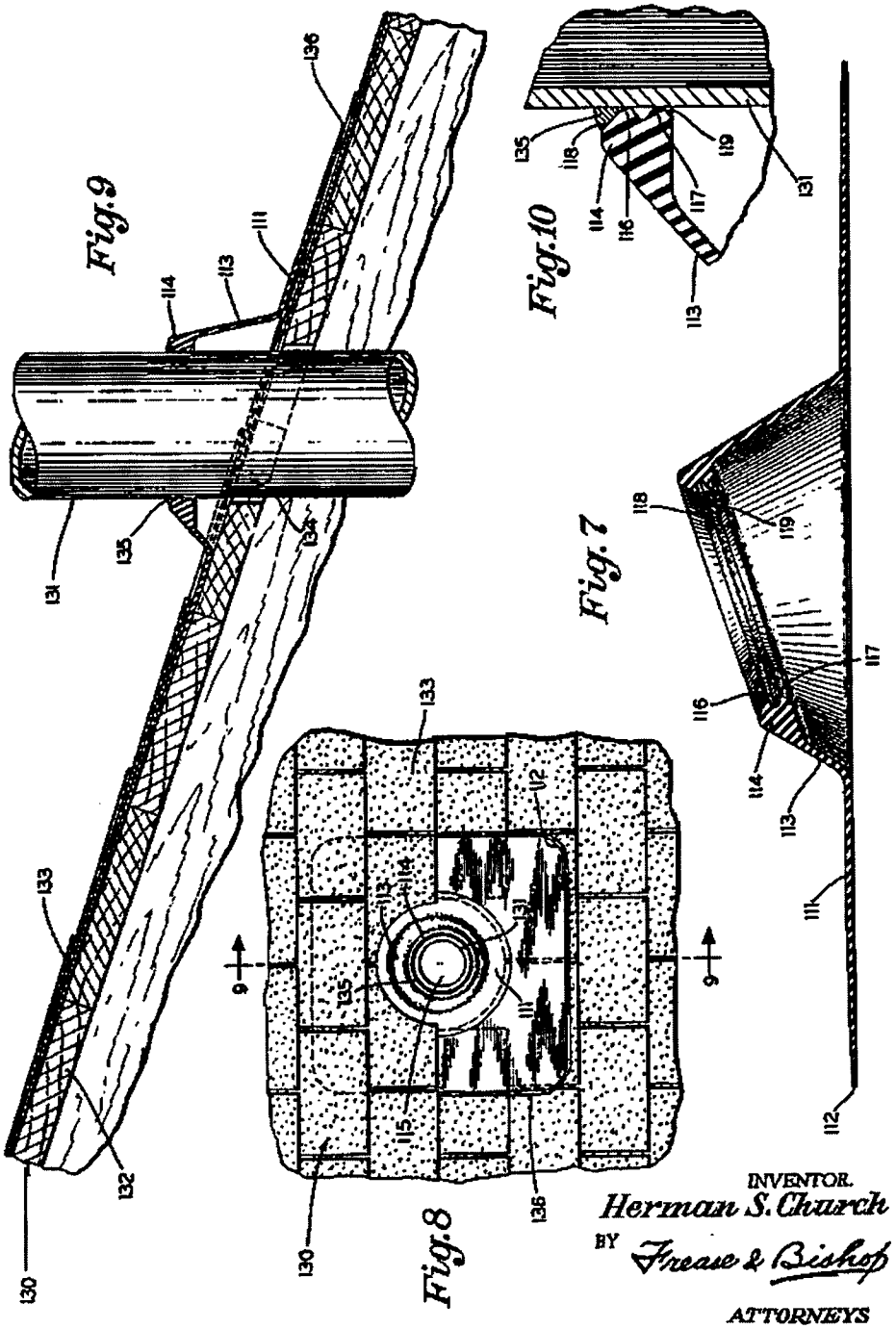
Filed Dec. 20, 1957 2 Sheets-Sheet 1



May 23, 1961 H. S. CHURCH 2,985,465

ROOF FLANGE CONSTRUCTION

Filed Dec. 20, 1957 2 Sheets-Sheet 2



United States Patent Office 2,985,465 Patented May 23, 1961

2,985,465

ROOF FLANGE CONSTRUCTION

Herman S. Church, Cuyahoga Falls, Ohio, assignor to The Monarch Rubber Company, Hartville, Ohio, a corporation of Ohio

Filed Dec. 20, 1957, Ser. No. 704,113

4 Claims. (Cl. 285—42)

My invention relates generally to improvements in roof flange constructions of the type for providing a waterproof and weatherproof seal between the roof of a building structure and a pipe, such as a vent pipe, protruding therethrough.

The most generally used prior construction of roof flange which has been used in building structures for the foregoing purpose has been formed completely of metal and generally lead. This prior roof flange construction has usually included a flat plate portion secured to the roof and having a necked portion formed centrally thereof to be telescoped over the pipe protruding through the roof, with both the plate portion and neck portion being sealed to the roof and pipe by any usual roofing compound sealing means.

One major difficulty with this prior construction of metal roof flange is that it is difficult to provide a thorough and lasting seal between both the metal plate portion and the roof and the metal neck portion and the metal pipe, since slight irregularities in the roof sheeting and the pipe receiving the neck portion, due to the stiffness of the metal, cause large voids which must be thoroughly filled and sealed requiring skilled workmen to properly accomplish this sealing operation. A further factor which complicates this problem is that the vent pipes are frequently formed of cast iron and, during the formation thereof, a close outer circumference tolerance is not maintained so that there can be variations as much as one-quarter inch in diameter at the outer circumference of the pipe.

Thus for practical production of these metal roof flanges, it is necessary to provide the inside diameter of the necked portions thereof sufficiently large to receive even the largest diameter pipe that might be used. When, however, a pipe is encountered which has the minimum outside diameter, that is, one-quarter inch less, the problem of sealing between the pipe and this neck portion becomes considerably more troublesome.

Still another problem involved in the use of these prior metal roof flanges is caused by the fact that the plate portion thereof is sealing against a wooden roof and the neck portion is sealing against a metal pipe, which metal pipe has a different thickness and is formed of a different metal than this neck portion. For this reason, under changing temperature conditions, the roof, roof flange and pipe will all be affected by different rates of expansion and contraction so that it is difficult, if not impossible, to maintain a proper water-tight and weatherproof seal between the roof flange, the roof and the pipe, even though the sealing means therebetween is a somewhat plastic material.

Finally another problem involved in the use of these prior roof flange constructions is that these prior roof flanges, being formed of metal, are difficult to adapt to the great number of different pitches of roofs encountered in modern home and building construction. Thus it is necessary to provide a large number of different configurations of these roof flanges in order to be able to supply

the particular roof flange for the particular pitch of roof.

It is therefore a general object of the present invention to provide a roof flange construction which overcomes the difficulties and disadvantages encountered in use of the prior constructions.

It is a primary object of the present invention to provide a roof flange construction which can be easily and conveniently installed for sealing between a roof and vent pipe extending through the roof and which does not require any special skill for the installation thereof.

It is a further object of the present invention to provide a roof flange construction which is completely flexible and will readily adapt for changing temperature conditions while still maintaining an efficient seal.

It is still a further object of the present invention to provide a roof flange construction which is formed with special sealing means for sealing around the pipe extending through the roof which roof flange will automatically adapt for various size pipe within reasonable tolerances.

It is also an object of the present invention to provide a roof flange construction for sealing around a pipe extending through a roof which may be used for various pitches of roofs within reasonable limits thereby requiring a lesser number of specific shapes of these roof flanges to be carried by a supplier thereof.

It is an additional object of the present invention to provide a roof flange construction for sealing between a roof and a pipe extending therethrough, which roof flange may also be used for providing waterproof connection and efficient seal between a flat roof and the roof drainpipes thereof.

Finally it is an object of the present invention to provide a roof flange construction which accomplishes all of the above objects and provides all of the above advantages, yet may be manufactured and supplied at a minimum of expense.

These and other objects are accomplished by the parts, constructions, arrangements, combinations and subcombinations comprising the present invention, the nature of which is set forth in the following general statement, preferred embodiments of which—illustrative of the best mode in which applicant has contemplated applying the principles—are set forth in the following description and illustrated in the accompanying drawings, and which are particularly and distinctly pointed out and set forth in the appended claims forming a part hereof.

In general terms the roof flange construction comprising the present invention may be stated as including a substantially flat flexible flange portion having a preferably generally rectangular outer configuration and terminating inwardly in a flexible neck portion extending away from the flange portion. Both the flange and neck portions are relatively thin, with the flange portion preferably tapering to a feather edge at its outer edges.

The neck portion terminates spaced from the flange portion in seal means, preferably having a greatly increased cross-sectional thickness from the cross-sectional thickness of either the neck or flange portions. Further this seal means terminates inwardly in two spaced inwardly projecting sealing lips which are adapted to surround and seal against the outer circumference of a pipe.

Still further each of the sealing lips is preferably triangular in cross section tapering inwardly to an apex and these sealing lips are positioned at the upper and lower extremities of the seal means so that one of the tapered side portions of each of these sealing lips forms the inner extremity of the upper and lower extremities of this seal means. Thus a downwardly angled void is formed between the upper sealing lip and the outer circumference of a pipe against which this lip is sealing and an upwardly angled void is formed between the lower sealing lip and a pipe against which this lip is sealing.

either of which voids may be filled with a plastic roofing compound sealing material for aiding in sealing between the pipe and seal means.

By way of example, embodiments of the roof flange construction of the present invention are illustrated in the accompanying drawings forming a part hereof, wherein like numerals indicate similar parts throughout the several views, and in which:

Fig. 1 is a top plan view of the first embodiment of the roof flange construction comprising the present invention;

Fig. 2, a sectional view, part in elevation, looking in the direction of the arrows 2—2 in Fig. 1;

Fig. 3, a vertical sectional view, part in elevation, showing the roof flange construction of Figs. 1 and 2 installed for sealing between a flat roof and a vent pipe extending therethrough;

Fig. 4, an enlarged fragmentary sectional view taken from Fig. 3 and showing the area of the seal between the roof flange and the pipe;

Fig. 5, a vertical sectional view, part in elevation, showing the roof flange construction of Figs. 1 and 2 installed sealing between a flat roof and a drainpipe of said roof;

Fig. 6, an enlarged fragmentary sectional view taken from Fig. 5 showing the area of the seal between the roof flange and the pipe;

Fig. 7, a vertical sectional view of a second embodiment of the roof flange construction comprising the present invention;

Fig. 8, a top plan view showing the roof flange construction of Fig. 7 installed on a roof and sealing between a roof and vent pipe extending therethrough;

Fig. 9, a sectional view, part in elevation, looking in the direction of the arrows 9—9 in Fig. 8; and

Fig. 10, an enlarged fragmentary sectional view taken from Fig. 9 and showing the area of the seal between the roof flange and the pipe.

The first embodiment of the roof flange construction comprising the present invention is shown in Figs. 1 and 2 and includes a substantially flat flange portion 11, preferably having a rectangular outer edge 12. Further flange portion 11 terminates inwardly and preferably central thereof in a neck portion 13 which angles inwardly and upwardly away from the flange portion.

Still further the neck portion 13 terminates upwardly, spaced above the flange portion 11, in a sealing portion 14 with this sealing portion terminating inwardly in a predetermined size of opening 15. The entire roof flange construction is formed from a flexible material which may be rubber or one of the synthetic rubber compositions, but it is preferred that this material is neoprene for its oil, acid and sun-checking resistance.

Flange portion 11, in cross section, may be formed of a steadily decreasing width outwardly and tapers to a so-called feather edge at outer edge 12. The maximum thickness of flange portion 11 is at the point of connection between this flange portion and the neck portion 13, with the neck portion 13 having approximately the same cross-sectional thickness as the maximum thickness of flange portion 11.

Both flange portion 11 and neck portion 13 are, however, relatively thin, as shown, for maximum flexibility, with the sealing portion 14 having a greatly increased thickness in the order of between two and six times the thickness of neck portion 13. Thus the sealing portion 14 is of greatly increased mass over any given section of the flange portion 11 and neck portion 13 and this sealing portion therefore protrudes inwardly from the neck portion 13 terminating preferably in a circular opening 15.

Sealing portion 14 at opening 15 is provided with an upper sealing lip 16 and lower sealing lip 17 with both of these sealing lips being substantially triangular in cross section having their apices at the opening 15 and increasing in width outwardly. The lower side of the upper sealing lip 16 and the upper side of the lower sealing lip 17 angle upwardly and downwardly respectively, as best seen in Fig. 2, so that these two sealing lips may be compressed outwardly without interference from each other.

Further the upper sealing lip 16 angles outwardly to the upper extremity of sealing portion 14, thus forming the angled portion 18 at the top of the sealing portion. Finally the lower sealing lip 17 angles outwardly and downwardly to the lower extremities of the sealing portion 14 forming the angled portion 19 at the lower edge of the sealing portion.

As shown in Figs. 1 and 2, the first embodiment of the roof flange construction has the axis of the opening 15 at right angles to the plane of the flange portion 11 so that the plane of the upper extremities of the sealing portion 14 is generally parallel to the plane of the flange portion 11. Thus this particular embodiment is adapted for use with a flat roof or a roof having only a slight pitch.

As an example, for showing the increased mass of the sealing portion 14 over the neck portion 13, the neck portion may have a thickness of about ¼ inch while the sealing portion 14 at its minimum thickness, that is, the depression formed between the sealing lip 16 and sealing lip 17 may be about ⅜ inch. Furthermore with these dimensions the thickness of the sealing portion at the apex of the upper sealing lip 16 will be about 1/16 inch and at the apex of the lower sealing lip 17 about ⅝ inch, with this sealing portion 14 having substantially the same dimensions throughout its circumference because of the axis of the opening 15 extending at right angles to the plane of the flange portion 11.

As shown in Fig. 3, the first embodiment of the roof flange construction may be installed for providing a waterproof and weatherproof seal between a flat roof, generally indicated at 20, and a vent pipe, generally indicated at 21. The flat roof 20 may be formed of a layer of wood sheathing 22 and a series of layers 23 of asphalt impregnated and coated roofing material of usual construction.

The vent pipe 21 is usually a cast-iron pipe having an outside diameter varying from about four inches to about four and one-quarter inches, and extends upwardly through the roof 20 through an opening 24. Further the outer surface of the pipe 20 may range from relatively smooth to extremely rough.

The roof flange construction of the present invention is preferably installed by first applying the initial layer of roofing material 23 on the wood sheathing 22 and then telescoping the sealing portion 14 of the roof flange construction over the pipe 21 until the flange portion 11 is lying flat on this first layer of roofing material 23. An asphalt roof sealing compound may be placed between the flange portion 11 and the first layer of roofing material 23 if desired, but under most circumstances an excellent seal will be provided between these materials and also the additional layers of roofing materials 23 merely by the asphalt coating on this roofing material adhering to and sealing with the flange portion 11.

The sealing lips 16 and 17 on the roof flange construction are preferably formed with inside diameters of 3 15/16 inches, that is, 1/16 inch less than the possible minimum outside diameter of the pipe 21, so that when the sealing portion 14 is telescoped over pipe 21, a compression is provided therebetween compressing the apices of the sealing lips 16 and 17 and providing a tight seal between these sealing lips and the pipe 21. This compression between the sealing portion 14 and the pipe 21 is insured and maintained indefinitely due to the greatly increased thickness or mass of this sealing portion 14 as hereinbefore described and shown.

The void formed around the pipe 21 between the angled portion of the roof flange and this pipe is filled with a usual asphalt roofing compound shown at 25 and in enlarged view in Fig. 4, thereby completing the seal between pipe 21 and the sealing portion 14 of the roof flange. Finally asphalt roofing compound may be applied between the overlying layers of roofing material 23 and the flange portion 11 of the roof flange as shown

at 26 to provide a more efficient seal at this point and prevent moisture from working back between the flange portion 11 and the layers of roof material 23.

As shown in Figs. 5 and 6, this first embodiment of the roof flange construction comprising the present invention may also be used for providing a seal between a flat roof and a drainpipe, such pipe being used for draining water from the roof. As shown in Fig. 5, the roof flange construction is installed in a similar manner except that the neck portion 13 extends downwardly rather than upwardly.

Thus the flange portion 11 is positioned between the layers of roofing material 23 of the flat roof 20 and above the wood sheathing 22, but the neck portion 13 extends through a larger opening 27 and projects downwardly below the wood sheathing 22.

The drainpipe 28 similarly is telescoped by the sealing portion 14 so that the sealing lips 16 and 17 provide a seal against this drainpipe. Finally, since the angled portion 19 of sealing lips 17 is exposed upwardly, the void formed by the angled portion 19 and the pipe 28 is filled with the roofing compound, as shown at 29, with this seal between sealing portion 14 and pipe 28 being shown in enlarged view in Fig. 6.

The second embodiment of the roof flange construction comprising the present invention is shown in Fig. 7 and is very similar to the first embodiment with the exception that it is adapted for sealing between a vent pipe and a roof having more than just a slight pitch. The only change required from the first embodiment construction, for providing this second embodiment construction, is that the plane of the upper extremities of the sealing portion does not extend in a plane parallel to the plane of the flange portion, but rather these planes extend at an angle, the degree of which depends on the pitch of the roof.

Referring to Fig. 7, similar to the first embodiment, the roof flange construction includes the flange portion 111 tapering outwardly to the feather edge 112 and terminating inwardly in the upwardly and inwardly angled neck portion 113. Further neck portion terminates upwardly in the sealing portion 114, with this sealing portion terminating inwardly at the opening 115 and having the upper sealing lip 116 and lower sealing lip 117.

Sealing lips 116 and 117 are similarly formed with sealing lip 116 angling upwardly to the upper extremities of the sealing portion 114 forming the angled portion 118 and the lower sealing lip 117 angling downwardly to the lower extremities of the sealing portion to form the angled portion 119. Finally, flange portion 111 and neck portion 113 are formed relatively thin, whereas the sealing portion 114 is formed of increased thickness and having a minimum thickness in the order of two times that of the neck portion 113 to provide a greater mass of material behind the sealing lips 116 and 117 and insure the proper sealing thereof.

Thus, the sealing portion 114 again may have a thickness of between about two and about six times the thickness of the neck portion 113, and as an example of the dimensions, the thickness of the neck portion 113 may again be ⅛ inch with the minimum thickness of the sealing portion 114, that is, between the sealing lips 116 and 117 being about ¼ inch at the right-hand side of the sealing portion as shown in Fig. 7, with this minimum thickness increasing to about ⅜ inch at the left-hand side as shown in Fig. 7. This variation in thickness of the sealing portion 114 is, of course, caused by the fact that the axis of the opening 115 does not extend perpendicularly to the plane of the flange portion 111 so that the plane of the upper extremities of the sealing portion 114 extends at an angle to the plane of the flange portion 111, as shown.

Further, in the above example the thickness of the sealing portion 114 at the apex of the upper sealing lip 116 is about 7/16 inch throughout the circumference of this sealing lip. Finally the minimum thickness of the sealing portion at the apex of the lower sealing lip 117 is about ½ inch, as shown at the right-hand side of Fig. 7, with the maximum thickness at this point being about ⅝ inch, as shown at the left-hand side of Fig. 7.

As shown in Figs. 8, 9 and 10, this second embodiment of the roof flange construction is applied to the roof, generally indicated at 130, surrounding and providing a waterproof and weatherproof seal between this roof and the vent pipe 131. In this case, however, the roof 130 is formed from the usual wood sheathing 132 covered with the usual overlapped asphalt shingles 133, with the vent pipe 131 extending through the opening 134 in the wood sheathing and shingles.

The same relationship of sizes between the outer diameter of the vent pips 131 and the inner diameter of the sealing lips 116 and 117 is provided in this second embodiment as was provided in the first embodiment, that is, the inner diameter of the sealing lips being less than the minimum possible outer diameter of the vent pipe 131 to provide compression between these sealing lips and the vent pipe thereby insuring sealing therebetween. Furthermore the usual asphalt roofing compound is applied at 135 filling the void formed between the angled portion 118 of the sealing portion 114 and the vent pipe 131, thereby completing the seal betwen sealing portion 114 and the vent pipe, such completed seal being shown in enlarged view in Fig. 10.

This second embodiment of the roof flange construction is preferably applied during the application of the shingles 133 to the wood sheathing 132 with the upper half of the flange portion 111 underlying the shingles 133 and the lower half of this flange portion overlying these shingles, as shown. Finally roofing compound may be applied between the edge 112 of flange portion 111 and the shingles 133 where this flange portion overlies the shingles and is therefore exposed, such roofing compound being indicated at 136 in Figs. 8 and 9.

It is important for the purposes of the present invention to provide the flange portion 11 or 111 and the neck portion 13 or 113 relatively thin to obtain maximum flexibility of these portions so that the roof flange construction may conform to the particular roof upon which it is being applied. For instance, as shown in the second embodiment, the pitch of the roof 130 can obviously vary considerably and the flange portion and neck portion 113 will still easily conform to this different pitch of roof. Also, a proper and sufficient seal will still be provided between the sealing portion 114 and any vent pipe 131.

Further, it is important for the purposes of the present invention that the sealing portion 14 or 114 are formed of increased thickness providing an increased resilient mass at this point over the thickness of the neck portion 113. With this increased mass of the sealing portions an increased resistance to deformation is provided backing up the sealing lips 16 and 17 or 116 and 117, thereby insuring an efficient seal between these sealing lips and the particular vent pipes around which they are sealing.

Still further it is advantageous to provide the angled portion 35 or 135 at the upper extremities of the sealing portion 14 or 114 so that the voids formed between these angled portions and the vent pipes can be filled with roofing compound to insure a more complete and lasting seal. It is also advantageous to provide the angled portion 19 or 119 at the lower extremities of the sealing portion 14 or 114 so that this roof flange construction is adaptable for merely being reversed to provide a seal between a roof and a drainpipe from the roof.

Additionally, it is advantageous to taper the flange portion 11 or 111 outwardly and terminate these flange portions in a feather edge 12 or 112 for increased flexibility of the flange portions and for more efficient sealing of the edges against the particular roof. Finally, since the entire roof flanges of the first and second em-

bodiments are formed of one piece and totally of resilient material, these roof flanges will automatically compensate for any differences in expansion and contraction between the various materials while still maintaining a waterproof and weatherproof seal.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example and the scope of the present invention is not limited to the exact details of the construction shown.

Having now described the invention, the construction, operation and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby, the new and useful construction and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

I claim:

1. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding said opening for resiliently sealing against a pipe received in the opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe, and the minimum thickness of the sealing portion at least in outward alignment with the sealing lip means upper and lower sealing lips being greater than the maximum thickness of the neck and flange portions for providing an increased mass to back up and retain the lip means resiliently sealed against the pipe.

2. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding the opening and resiliently sealing against a pipe received in said opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, and at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe.

3. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having spaced upper and lower resilient material sealing lip means formed thereon and extending inwardly of the sealing portion surrounding the opening for resiliently sealing against a pipe received in said opening, the upper sealing lip means having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the lower sealing lip means having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe, and the minimum thickness of the sealing portion at least in outward alignment with the upper and lower sealing lip means being at least double the maximum thickness of the neck and flange portions for providing an increased mass to back up and retain the lip means resiliently sealed against the pipe.

4. Roof flange construction for providing a seal between a roof and a pipe positioned at an opening of the roof including a substantially flat resilient material flange portion, the flange portion terminating outwardly in a substantially feather edge, the flange portion surrounding and terminating inwardly in an integral resilient material tubular neck portion, the neck portion extending from the flange portion and terminating spaced from said flange portion in an integral resilient material sealing portion, the sealing portion having an opening formed therethrough, the sealing portion having resilient material sealing lip means including spaced upper and lower inwardly tapered sealing lips formed thereon and extending inwardly of the sealing portion surrounding the opening and resiliently sealing against a pipe received in said opening, the sealing lip means upper sealing lip having an angled upper side surface angling downwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, the sealing lip means lower sealing lip having an angled lower side surface angling upwardly and inwardly toward the opening forming a void between the sealing portion and the pipe received in said opening, and at least one of said voids being adapted for being filled with a plastic roofing compound to increase the seal between the sealing portion and the pipe.

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[45] **Dec. 5, 1972**

[54] **BELLOWS SLEEVE**

[72] Inventor: **Wolfgang Didszuhn**, Weckenweg 44, 8081 Oberhaunstadt, Germany

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[21] Appl. No.: **194,670**

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** **F16j 3/00**

[58] **Field of Search** ..... 277/199, 212, 212 FB; 285/226, 285/228, 235, 236, 237; 287/85

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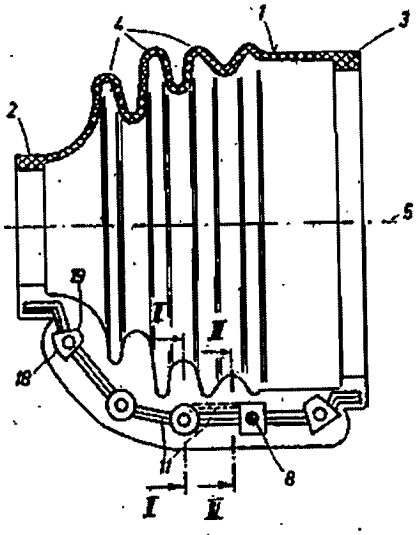
Primary Examiner—Joseph R. Leclair
Assistant Examiner—Robert L. Smith
Attorney—W.G. Fasse

[57] **ABSTRACT**

The bellows sleeve is provided with a slot extending at least partially and longitudinally there through. Adjacent to the slot there are provided flanges which comprise one or more tongues with a wedge shaped cross-section as well as wedge-shaped grooves into which the tongues fit. The flanges are clamped together, for example, by means of screws extending with a press fit through bores in respective material accumulations or lands provided in one of the flanges and respective recesses into which the lands fit in the other flange. Preferably, the lands fit into the recesses also with a press fit.

12 Claims, 4 Drawing Figures



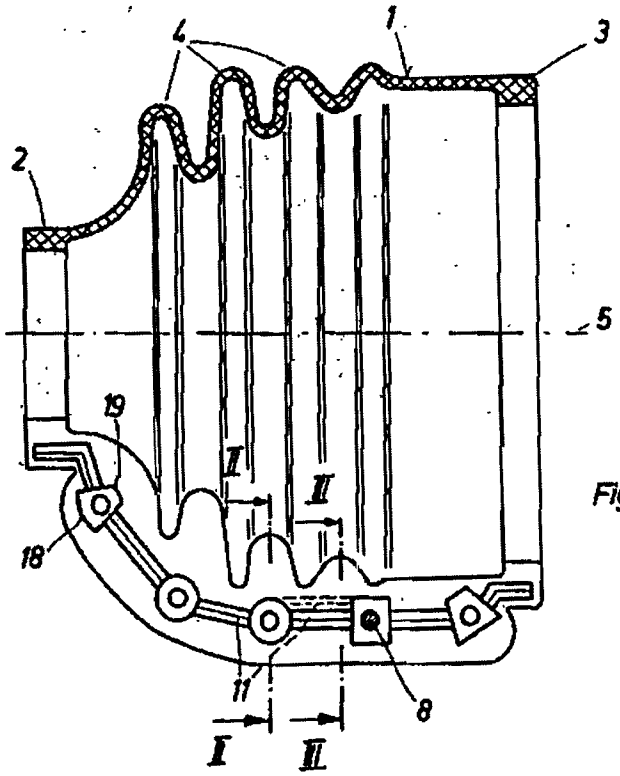


Fig. 1

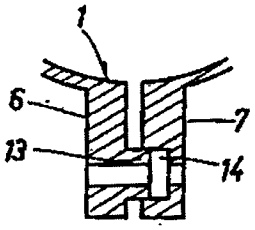


Fig. 2

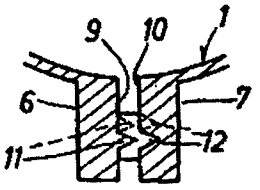


Fig. 3

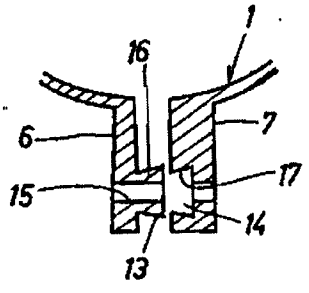


Fig. 4

BELLOWS SLEEVE

BACKGROUND OF THE INVENTION

The present invention relates to so called bellows sleeves employed for sealing purposes between moving parts. More specifically, the invention relates to such bellows sleeves as are employed for sealing jointed cross shaft axles especially such semi-axles relative to the respective axle gear. These sleeves are made of elastic material such as rubber and are divided longitudinally at least along a portion of the sleeve body. Along the dividing slot there extend flanges radially outwardly which are provided with surfaces facing each other and including sealing tongues and grooves which are pressed against each other by means of screws.

Many suggestions have been made heretofore for the improvement of such bellows sleeves. Mainly these suggestions have been concerned with the improvement of the materials of which the bellows sleeves are made because the requirements with regard to the oil resistance, a sufficient elasticity, and a long life have called for special attention. However, the closure of the divided sleeve also requires substantial attention because the closure as such constitutes a weak spot. This is so because the flanges which are clamped to each other by means of screws are subject to a certain mechanical working or squeezing, although the sleeves are positioned in such a manner that the flanges are located in a neutral motion zone. Accordingly, inspite of said tongues and grooves, the sealing has not always been completely satisfactory.

Sealing failures also occurred as a result of the natural aging of the respective material. A reduced elasticity in turn results in a reduction of the effectiveness or intensity with which the clamping screws hold the flanges together whereby the sealing effect is also reduced.

In order to overcome these difficulties, it has been suggested heretofore to provide the flanges with wide grooves and respect-ively wide or broad bulges. However, it has been found that by these means it was not possible to achieve substantial improvements because the cooperating areas are relatively large and the specific pressure which is rather significant for achieving a good sealing effect is accordingly reduced.

OBJECTS OF THE INVENTION

In view of the foregoing, it is the aim of the invention to achieve the following objects singly or in combination:

to overcome the outlined drawbacks of the prior art, more specifically, to achieve a good sealing of bellows sleeves even over prolonged periods of use;

to provide a special sealing effect in the area of the flanges, especially along the dividing line and this even after prolonged use;

the improved sealing is to be achieved while simultaneously avoiding increasing the wall thickness of the flanges along the dividing line;

to provide improved sealing characteristics while, at the same time, requiring less material than heretofore for making the sleeves; and

to construct and shape the entire bellows sleeve in such a manner that it may be easily manufactured so that the final product will be relatively inexpensive.

SUMMARY OF THE INVENTION

The above objects have been achieved according to the invention by providing the tongue as well as the groove with a cross-sectional shape having a wedge configuration, preferably a rather pointed wedge configuration and by further providing material accumulations in the range of the clamping screws which accumulations fit into respective recesses arranged opposite of said accumulations.

The pointed wedge configuration of the tongue and groove has the advantage that they take up very little space so that the size of the flanges does not need to be increased. To the contrary, the rather narrow tongues and grooves permit the use of shorter flanges, that is the flange dimension in the radial direction may be reduced so that less material is required for making the present sleeves.

Another, even more important advantage of the tongue and groove configuration as taught by the invention is seen in that, the pointed shape results in high specific sealing pressure which assures a safe sealing. The weak spots which were present heretofore especially around the clamping screws have been removed according to the invention by said material accumulations and respective recesses arranged around said clamping screw. Thus, the invention is seen in the combination of the pointed wegde shaped tongues and grooves with the material accumulations and recesses.

It has been found that the present bellows sleeves may be easily produced inspite of the improved sealing efficiency because the cooperating sealing means have a relatively simple shape.

BRIEF FIGURE DESCRIPTION

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 illustrates a longitudinal sectional view through a bellows sleeve according to the invention;

FIG. 2 is a sectional view along the line II—II in FIG. 1;

FIG. 3 is a view along line III—III in FIG. 2 and showing the section through the wedge shaped tongue and groove; and

FIG. 4 is a view similar to that of FIG. 2 but illustrating a differently shaped material accumulation and respective recess in the area of a clamping screw.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

Referring to FIG. 1, the bellows sleeve 1 is provided with two connection cuffs 2 and 3 which may be connected to housing members or the like(not shown) by means of clamping straps. The sleeve 1 forms several folds 4. The sleeve is slotted longitudinally along a plane extending through the axis 5 of the sleeve and through the plane defined by the drawing sheet. As is best seen in FIGS. 2, 3, and 4, adjacent to the slot the sleeve is provided with flanges 6 and 7 extending radially away from the sleeve proper. The flanges 6 and 7 are clamped to each other by a plurality of clamping screws 8, one of which is shown in FIG. 1.

The flanges 6 and 7 have inner surfaces 9 and 10 facing each other. In order to provide a sufficient sealing

between these surfaces 9 and 10, the surface 9 is provided with a tongue 11 having a wedge shaped cross-sectional configuration, especially a pointed wedge shaped configuration whereas the opposite surface 10 is provided with a wedge shaped groove 12 in register with the tongue 11 so that the latter snuggly fits into the groove. The size of the tongue 11 and of the respective groove 12 is such that a high specific area pressure is accomplished along the flanges between the tongue and groove.

If desired, several tongues 11 and several grooves 12 may be arranged in parallel to each other as is indicated by phantom lines in FIG. 3. Such a double or even triple tongue and groove arrangement substantially increases the sealing characteristics of the sleeve because the plurality of tongues gripping into a like plurality of grooves forms a kind of labyrinth packing or seal. It has been found that the proper sealing characteristics are maintained even if the sleeve is subjected to torsional forces.

Each of the clamping screws 8 extends through a respective material accumulation 13 and a respective recess 14 arranged in the surfaces 9 and 10 at those points where the clamping screws extend through the two flanges. The recesses and respective material accumulations are arranged in such positions that the tongues and grooves and the material accumulations as well as the respective recesses form a continuous sealing line. This feature enhances the sealing characteristics substantially in combination with the above mentioned labyrinth seal.

The material accumulations 13 and the recesses 14 are dimensioned in such a manner that a light press fit is provided between the material accumulation and recess. The clamping screws 8 extend through bores 15 in the material accumulation and the portion of the flange wall in register with the recess whereby the diameter of the bore is slightly smaller than the outer diameter of the screw to provide a further press fit between the flange material around the material accumulation and the respective screw. Furthermore, it has been found that the material accumulations should have a height above the flange surface proper which is higher than the height of the tongue 11.

It is preferable that the tongues 11 and material accumulations 13 are arranged on one surface, for example, surface 9 and that the grooves 12 and recesses 14 are arranged on the opposite surface 10. This facilitates the production of the sleeve and flanges in a integral one piece fashion. The material accumulation 13 may have, for example, a cylindrical shape as seen in FIGS. 1 and 2. As a modification, the material accumulations may have a rectangular shape or a trapezoidal shape as also shown in FIG. 1. The improved sealing characteristics are achieved by the above mentioned combination of the lip seal between the tongue and groove which results in an increased specific or area pressure, with the improved sealing in the area of the claming screws due to the light press fit between the material accumulation and the respective recess and the press fit between the screw and its respective bore.

In addition of the above mentioned cylindrical, rectangular, and trapezoidal shape for the material accumulations and respective recesses, FIG. 1 also shows that a trapezoidal shape may be modified by curved bounding surfaces 18 and 19 whereby the material accumulation as well as the respective recess will have such curved bounding surfaces.

The selection of the shape of the material accumulations 13 and the respective recess 14 will mainly depend on the size of the sleeve and also on the flexibility required in any event in the area of the flanges 6 and 7. Thus, a cylindrical shape will be preferable where a compact flange configuration and a good elasticity are required. For large size, heavy sleeves as, for example, may be used in connection with trucks where a lower elasticity is feasable the rectangular or trapezoidal shapes and especially the trapezoidal shape with curved surfaces 18 and 19 may be employed. In the latter instance, the curved surfaces may form portions of cylinder surfaces whereby for example the cylinder surface 19 faces inwardly relative to the sleeve, whereas the cylinder surface 18 faces outwardly. It has been found, that this configuration assures a good fit and permits an easy as well as harmless possibility for rotation or twisting even where the sleeve is subjected to a sharp buckling action.

Preferably, the bounding walls of the accumulations 13 and the respective recesses 14 should extend perpendicularly relative to the surfaces 9 and 10 of the flanges 6 and 7. However, it is also possible to provide a press or snap fastener action by providing the accumulation 13 as well as the recess 14 as shown in FIG. 4 with back-tapers 16 and 17. This feature provides an especially good anchoring whereby, at least for short time periods, the seal may be maintained even without a clamping screw.

Referring further to FIG. 4, it will be noted that the flange 6 may have a wall thickness smaller than the flange 7. This is possible because the tongue 11 and the accumulation 13 compensate for the thinner wall thickness and the good sealing characteristics are thereby maintained. In this connection it is surprising that the wedge shaped tongue and grooves improve the elasticity of the entire sleeve. Other groove and tongue forms employed heretofore caused a stiffening of the entire flange structure.

The above mentioned feature of making the height of the material accumulations 13 higher than the height of the tongues 11 provides so called creeping paths of increased length which is especially advantageous where the sleeves are employed in connection with jointed cross shaft semi-axles of motor vehicles. Surprisingly, these creeping paths facilitate a continuous pressing and squeezing action.

The arrangement of all the tongues 11 and all the material accumulations 13 on one and the same surface and the arrangement of all the grooves 12 and recesses 14 in the other flange surface has the advantage that the tools for producing the present sleeve are simplified.

A further advantage is seen in that the tongue and groove arrangement results in substantial savings of material especially if taken in combination with the thinner flange walls now made possible by the invention and as shown in FIG. 4.

The above mentioned back-taper 16 and 17 also shown in FIG. 4 has the advantage of providing a snap fastener action, so that even where a clamping screw should break, the sudden and dangerous loss of lubri-

cant is avoided because this snap fastener action will maintain the seal at least until repair is possible.

Although the invention has been described with reference to specific embodiments, it is to be understood, that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claim is:

1. In a bellows sleeve having a body made of elastic material, a longitudinal slot in said body extending at least partially along said sleeve, first and second flange means extending longitudinally along said slot and radially away from said sleeve body, said flange means having surfaces facing each other, sealing tongue and groove means forming part of said surfaces and arranged for cooperation with each other, as well as means for clamping said flanges together at spaced points along the flanges, the improvement comprising a wedge cross-sectional shape for said sealing tongue means intermediate said clamping means, a corresponding wedge shape for said sealing groove means also intermediate said clamping means, material accumulations at said spaced points forming part of one of said flange surface, and corresponding recesses forming part of the other of said flange surfaces at said points for receiving said accumulations.

2. The bellows sleeve according to claim 1, comprising two wedge shaped tongues and two respective wedge shaped grooves in said flange surfaces for cooperation with each other.

3. The bellows sleeve according to claim 1, wherein said clamping means comprise screw means, a bore through each of said material accumulations and through the flange in register with the respective recesses, said bore receiving a respective one of said screw means with a press fit, said material accumulations and respective recess having a sealing improving shape such that each accumulation fits with a light press fit into the respective recess.

4. The bellows sleeve according to claim 3, wherein said material accumulation and the respective recess have a cylindrical sealing improving shape.

5. The bellows sleeve according the claim 3, wherein said material accumulation and the respective recess have a rectangular sealing improving shape.

6. The bellows sleeve according the claim 3, wherein said material accumulation and the respective recess has a trapezoidal sealing improving shape.

7. The bellows sleeve according to claim 6, wherein at least two opposite surfaces of said trapezoidal shape are curved.

8. The bellows sleeve according to claim 3, where said material accumulation has a height above the respective flange surface which is higher than the tongue.

9. The bellows sleeve according to claim 1, wherein said tongue and material accumulations form part of the surface of one of the flanges, and wherein the groove and the recesses are formed in the surface of the other of said flanges.

10. The bellows sleeve according to claim 9, wherein said flange which comprises said tongue and material accumulations has a wall thickness thinner than that of the flange which comprises said groove and recesses.

11. The bellows sleeve according to claim 1, wherein said material accumulations and said recesses comprise back-tapers whereby a snap-in action between the material accumulation and the respective recess is accomplished.

12. The bellows sleeve according to claim 1, wherein said tongue and groove as well as said material accumulations and recesses are arranged along a continuous line.

* * * * *

United States Patent [19]

Kaminski

[11] **3,807,110**

[45] **Apr. 30, 1974**

[54] **MULTIPURPOSE ROOF PENETRATING CURB**

[75] Inventor: Cyril John Kaminski, Broadview, Ill.

[73] Assignee: Pate Manufacturing Co., Broadview, Ill.

[22] Filed: Nov. 8, 1972

[21] Appl. No.: 304,851

[52] U.S. Cl. 52/219, 285/4, 285/44

[51] Int. Cl. E04d 13/14, E04g 15/06

[58] Field of Search .... 52/58, 219; 285/3, 4, 42-44, 285/137 R, 236

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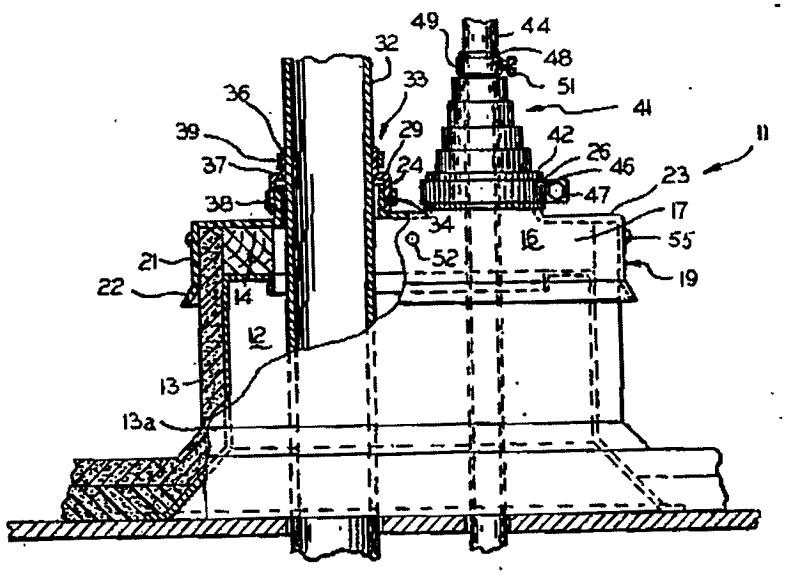
Primary Examiner—Henry C. Sutherland
Assistant Examiner—James L. Ridgill, Jr.
Attorney, Agent, or Firm—Alter Weiss Whitesel & Laff

[57] ABSTRACT

A multipurpose roof penetration curb comprises a rubber-like boot fitting over a plastic cap or cover over a curb surrounding an opening on the roof. The cap provides a plurality of potential openings any one of which may be cut open to provide a waterproof egress through the roof. The boot has a somewhat pyrimidal contour formed by a plurality of interconnected truncated cylinders. The boot may be cut away so that the cylinder having an inner diameter which matches the outer diameter of the pipe is the topmost cylinder. Strap clamps are used around the boot at the pipe and at the cap to provide a waterproof and weatherproof seal.

9 Claims, 3 Drawing Figures



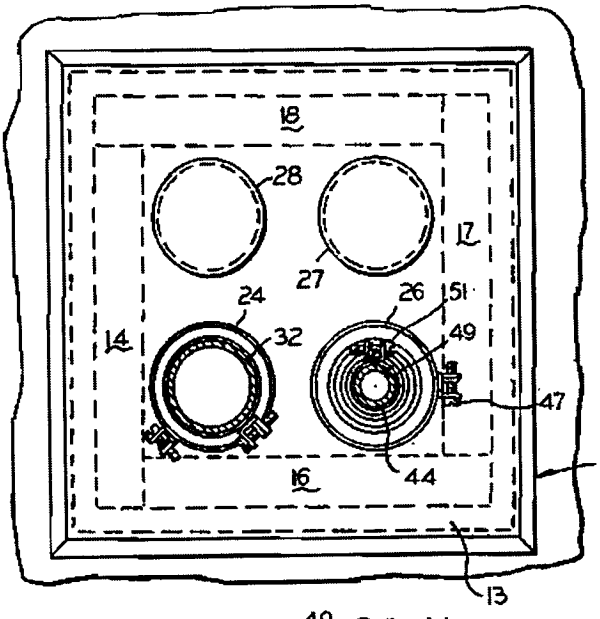


FIG.2

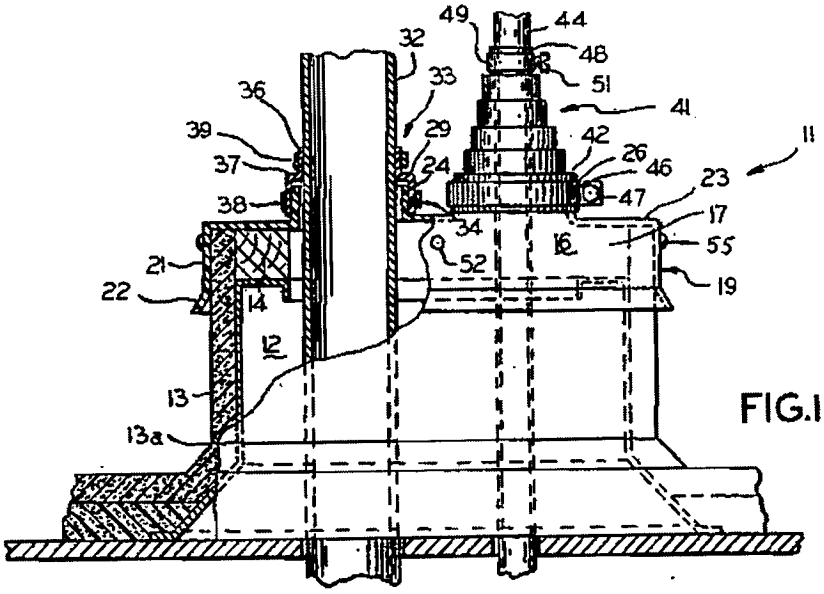


FIG.1

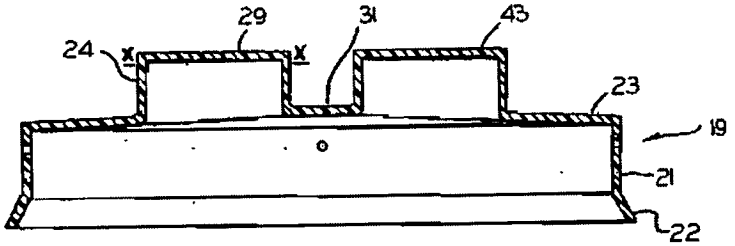


FIG.3

MULTIPURPOSE ROOF PENETRATING CURB

This invention relates to roof construction and, more particularly, to multipurpose roof penetration curb construction used to provide a weatherproof seal through a roof.

Many different types of pipes or other objects having generally circular cross-section pass through the outer covering or top of a roof on buildings. For example, antenna masts, plumbing and vent pipes or the like may pass through the roof of a building. These pipes may provide for roof-mounted air conditioners, electrical connections, water pipes, exhaust stacks, and the like.

It has always been a problem to provide a waterproof seal at points of egress through a roof, as at the juncture between the pipe and the roof. According to present day construction methods, this waterproof seal is essentially made by opening a hole in the roof, setting a curb over the hole, passing a smaller diameter pipe through the curb, filling the peripheral clearance between the pipe and curb, and then covering the curb and adjacent roof with any suitable pitch. This conventional method of construction not only is time consuming, but also is not the best way to provide a waterproof seal. Many problems arise due to leakage through the pitch, especially as it ages, shrinks, and cracks. The temperatures vary between baking in the hot summer sun and freezing during the cold winter night. Also, the seal must endure cold, wind, storm, snow, ice, and the like. Of course, there is a constant degradation due to the continual assaults by rain and ice.

One reason why this conventional method is used is that the pipes which pass through the roof have many different diameters. Thus, it has been most difficult to accommodate them with any prefabricated seal.

Accordingly, an object of this invention is to provide a new and improved roof penetration curb.

A related object of this invention is to provide a roof penetration curb assembly which can accommodate many different types and diameters of pipes.

Yet another object of this invention is to provide a multipurpose roof penetration curb having plastic caps or covers thereover and plastic boots used in conjunction with the caps or covers to enable egress from and provide a seal around the pipes that pass through the roof. Here an object is to avoid the necessity of using a pitch pocket.

Yet another object of this invention is to provide a boot which enables waterproofing and weatherproofing of pipes at the egress points through roofs.

Still another object of the invention is to provide such a cap made from ABS Plastic material that is especially well suited to protect it from the weather.

In keeping with an aspect of the invention, these and other objects and features are accomplished by providing a plastic cap or cover for a curb on a building roof. The plastic cap or cover is shaped with at least one upraised cylindrical section having an outside diameter for receiving the lowermost cylinder of the somewhat pyramidal boot. The boot is fabricated from a flexible, gasket-type of material. It comprises a plurality of integrally-formed truncated cylinders. The uppermost cylinder has the smallest diameter and the lowermost cylinder has the largest diameter, the inside diameter of which is the same as the outside diameter of the upraised cylindrical section of the cap or cover. Pipe clamps are used to seal both the smaller and the larger diameter boot cylinders.

A preferred embodiment of the invention may best be understood from a study of the following specification when taken in conjunction with the attached drawings wherein:

FIG. 1 is a side elevation view of the multipurpose roof penetration curb assembly in partial cross-section;

FIG. 2 is a plan view of the multipurpose roof penetration cap and curb assembly of FIG. 1; and

FIG. 3 is a side cross-sectional view of a multipurpose roof penetration curb cap or cover without the boot and prior to cutting.

FIG. 1 shows at 11 the inventive roof penetration curb assembly. The curb assembly 11 comprises a curb 12 which may be a sheet metal box-like structure, such as those that are commonly used in current roof construction. One type of curb taught in the recently filed U.S. Pat. Application Ser. No. 246,565, filed Apr. 24, 1972, and assigned to the Assignee of this invention may be used in the subject invention.

The curb 12 is surrounded by roofing felt shown in partial sectional form at 13. The roofing felt raises from the roof line and also surrounds the entire curb 12 and is nailed at the top of the curb to nailers or wooden beams 14, 16, 17 and 18. The curb 12 itself might be made from metal, plastic, wood or other suitable materials.

The curb assembly is topped with a curb cap or cover 19. The curb cover has a vertical apron 21 ending in a flared portion 19 which forms a drip edge. In a preferred embodiment of the cover the flare is 30° from the vertical. The vertical apron 21 goes into the top portion 23 which is integral to and forms the top portion of the curb cap or cover 19.

As is best seen in FIGS. 2 and 3, there are four upraised cylindrical sections on the curb cap or cover, such as upraised sections 24, 26, 27 and 28. The four upraised cylindrical sections are shown as being somewhat cap-shaped. These sections and the cap or cover 19 are one integral curb cover unit. The top 29 of any one or each upraised portion 24, 26, 27, 28 of the cover 19 is cut away as at line x—x to enable a pipe to pass therethrough. If no pipe is to pass therethrough, of course, the cover is left intact.

As can best be seen in FIG. 3, a drainage crown 31 is provided on the top of the curb cap or cover 19 to expedite the drainage of water, snow or the like from the top of the cover. The drainage crown is provided by molding the cap or crown with a raised center having a gentle slope toward all sides. The highest raised portion of the crown is at 31 and the slope is easily seen in FIG. 3.

While the cap or crown may be made from any suitable material, it is preferably made from ABS thermoplastics. These plastics are derived from acrylonitrile, butadiene, and styrene. They are hard, rigid, and tough, and are in the medium cost range. Usually the resins are opaque, and dark to light ivory in color. They can be pigmented to match almost any color, and produce finished parts of high luster.

Preferred properties of ABS plastics for use in this invention are set forth in the following table:

TABLE I.—Typical Properties of ABS Resins

	Grade				
	General purpose	Medium heat resistant	Maximum heat resistant	High impact	Self-extinguishing
Impact strength, notched ¼ in., Izod specimen (ft. lb./in.):					
At 73 F	6.5	5.5	2.2	7.5	4.0
At −20 F	2.4	1.6	1.1	3.5	1.1
At −40 F	1.9	1.3	0.7	2.6	0.8
Tensile strength:					
At 73 F (p.s.i.)	5,900	6,500	7,400	4,900	5,300
Tensile modulus:					
At 73 F (1,000 p.s.i.)	300	340	390	240	290
Hardness, Rockwell R	103	105	111	89	92
Deflection temperature, unannealed (F):					
At 264 p.s.i.	186	201	224	187	184
At 66 p.s.i.	203	218	238	208	201
Coefficient of thermal expansion:					
(per °F × 10^{-5})	5.3	4.7	3.6	6.1	—

Blending grades may also be used for compounding with other resins to achieve special properties which are attractive when used to make the cap or cover 19. For example, ABS is alloyed with polycarbonate to achieve higher flexural modulus than either resin alone plus the deflection temperature improvement contributed by the polycarbonate and the molding ease contributed by the ABS. Other ABS resins are used to modify rigid PVC. Although ABS resins are not highly flammable, self-extinguishing grades are sometimes preferred, in which case they are coated with a flame-resistant material. Also, it is well to provide protection from ultraviolet degredation in the form of an acrylic coating. When used in regions of extreme temperature change, it is well to improve reflection temperature by annealing the parts.

ABS thermoplastics are used according to this invention because of their impact resistance, surface hardness, rigidity, and heat resistance, as well as their chemical resistance. The chemical resistance is especially important since it enables the cap or cover to stand up under the attack of high pollution impurities found in many cities. The ABS thermoplastics also lend themselves well to vacuum forming, and large extruded shapes can be fabricated. Generally, all grades of ABS thermoplastics are considered impermeable to water and thus are useful for the purpose taught herein. The low moisture absorption and resistance to cold flow contribute to the dimensional stability of the ABS thermoplastics which, of course, is extremely useful in the waterproofing and weatherproofing purposes acting as a roof curb cover to enable the egress of pipes.

FIGS. 1 and 2 show two pipes passing through the cap or cover 19 and on through the roof of the building. The first pipe 32 passes through the raised cylindrical portion 24 of the cover. First, the top 29 of the raised portion 24 is cut along line *x—x* on site. Then the pipe is slipped through the cover.

Next, a boot such as boot 33 is cut at one of the sections to provide a good fit between the outside diameters of the pipe and the inside of the boot. The boot is attached to the pipe and cylinder 24 to give the necessary waterproofing and to protect against the varying ambient weather conditions. Thus, in extremely hot weather, for example, the pipe will tend to expand; in cold weather it will tend to contract; and a waterproof cover follows the variations in the diameter of the pipe. The clamp squeezes the boot sufficiently to prevent seepage or leakage of water through the space between the pipe and the curb cap or cover.

Initially, the boot 33 is a somewhat pyramidal unit having a stepped configuration to conform to almost any standard pipe reasonably expected to be used in conjunction with the barrier system. The boot is then cut to the appropriate diameter for any given pipe. In the case of pipe 32, the cut boot has two steps with a first or larger diameter truncated cylindrical section 34 matching upstanding cylinder 24 and a second or smaller diameter cylindrical section 36. These two steps are integrally joined together. Here, strap type pipe clamps 38, 39 are used to complete the waterproof connections. However, any other well-known type fastener may also be used in place of the strap clamp arrangements.

In a similar manner, boot 41 is cut at a much higher point so that it fits a smaller pipe 44. The topmost cylindrical section 48 of the boot 41 is fixed to the pipe 44 by a strap clamp 49 and tightened with fastener 51. In like manner, the boot may be cut at any other similar cylindrical section in order to accommodate virtually any diameter pipe. Boot 41 may be made from any good, flexible, weather-resistant rubber-like material, preferably, neopreme rubber.

For attaching the cap or cover to the curb, a plurality of screws pass through holes in the cover 19 and into the nailer, as shown at 55. In practice then, the curb assembly surrounds an opening in the roof and attaches to adjacent structure. Roofing felt covers the curb and provides weatherproofing at the roof line. The opening in the top of the curb first covered with a curb cap or cover, preferably made from an ABS plastic having an acrylic coating. The cover has a numer of upraised cylindrical portions, any of which is cut to enable passage of pipes therethrough.

A boot having multiple cylinders, integral to one another, is built somewhat as a truncated pyramid, and is cut to have a desired upper inside diameter. The portions of the pyramidal boot that are smaller in diameter than the pipe are discarded. The pipe is fitted through the topmost cylinder, where the boot has been cut. Strap clamps attach the boot to the upraised portion of the curb cover and to the pipe. This roof sealing system provides an extremely efficient, long lasting water and weather proofed egress for pipes through roofs. The curbs, covers, and boots are fabricated away from the construction site but are fitted and assembled on the construction site. No additional flashing, pitch, or the like, is required. Thus, the device is less expensive and may be installed faster. It provides longer usage with less leakage or seepage during the years of actual use.

While the principals of the invention have been described above in connection with the specific apparatus and applications thereof, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention. Thus, the appended claims are to be construed to cover all equivalent structure.

I claim:

1. A multi-purpose roof penetration curb assembly for providing waterproof and weatherproof egress for pipes passing through roofs,

said assembly comprising curb means attached to a roof and surrounding an opening in the roof,

said curb having an open top,

plastic cover means shaped to fit over, be attached to and enclose the open top of said curb means,

said curb means having upstanding walls supported by and rising above said roof,

nailer means located atop said upstanding walls and surrounding the open top of said curb means,

roofing felt attached to said nailer means and covering said upstanding walls of said curb,

said cover means having substantially horizontal top side and a downwardly depending vertical apron integrally attached to said substantially horizontal surface,

said cover means being attached to said curb by fasteners going through said cover means and into said nailer,

said cover means having at least one upstanding vertical section integral therewith,

means for passing a pipe through said upstanding vertical section, and

boot means for making a waterproof seal between said pipe and said cover without requiring caulking,

said boot means having a first vertical section contiguous to the outer periphery of said pipe and a second vertical section contiguous to said upstanding cylindrical section.

2. The curb of claim 1 wherein said cover is an integral five-side box-like structure having a plurality of said cylindrical sections formed on one of said sides having a drainage dome and forming a top of said box-like structure,

each of said cylindrical sections comprising a circumfrential skirt with a closed top,

the other four of said sides of said box being a skirt depending from said top and forming a support at the perimeter thereof,

the free edge of each of said four sides flairing outwardly away from said curb to form a drip edge,

any of said cylindrical sections having said closed top cut therefrom providing a port for giving egress to said pipe, and

means for sealing said boot means around said pipe and around the circumferential skirt remaining after the top is cut from said cylindrical section.

3. The curb assembly of claim 1 wherein said boot means comprises a rubber-like member having a generally stepped pyramidal shape wherein each of the steps is generally cylindrical and integrally joined to adjacent members.

4. The curb of claim 3 wherein said boot is cut in the circumferential plane of at least one of said cylindrical members to fit the inside diameter of said boot to the outside diameter of said pipe.

5. The curb of claim 4 and strap clamp means surrounding said boot at the top and bottom thereof in order to attach said boot to said pipe and said upstanding cup means.

6. The curb assembly of claim 2 wherein said cover comprises a plurality of said upstanding cylindrical sections and the inside diameter of the largest cylindrical member of said boot means snugly fits over the outside diameter of said cylindrical sections.

7. The curb of claim 6 wherein said cover is an integrally formed member made of ABS plastic.

8. The curb of claim 7 wherein said cover is a five side box-like structure having said cylindrical sections formed on one of said sides at the top of said box-like structure, the other four of said sides depending from said top and forming a support at the perimeter thereof, the free edge of each of said four sides flaring outwardly to form a drip edge.

9. The curb of claim 8 wherein said upstanding cylindrical sections are formed on said top and said top is generally domed to provide drainage.

* * * * *

United States Patent [19]

Logsdon

[11] **4,010,578**

[45] **Mar. 8, 1977**

[54] **ROOF FLASHING STRUCTURE**

[76] Inventor: **Duane D. Logsdon, 1708 Calavera Place, Fullerton, Calif. 92631**

[22] Filed: **Nov. 11, 1974**

[21] Appl. No.: **522,788**

[52] U.S. Cl. **52/58; 52/199; 285/44**

[51] Int. Cl.² **E04D 1/36**

[58] Field of Search 52/58, 199; 285/42, 285/43, 44

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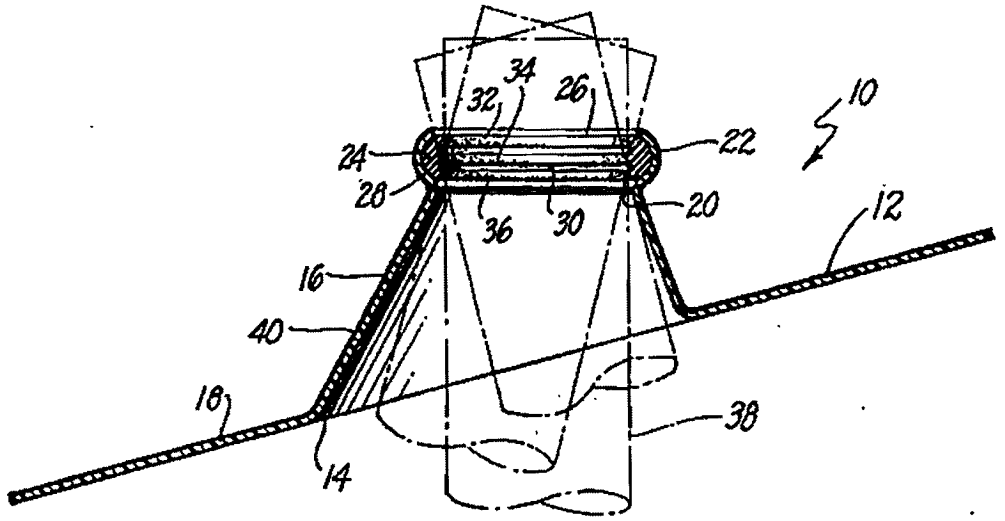
Primary Examiner—Ernest R. Purser
Assistant Examiner—Carl D. Friedman

[57] **ABSTRACT**

A roof flashing structure for use in forming a seal around a pipe on either flat roofs or roofs pitched at various common angles can be constructed utilizing a generally flat, imperforate plate having a centrally located opening. Such a plate carries an upstanding, imperforate housing extending outwardly from one side of the plate, this housing terminating in an open end located remote from the plate of larger dimension than the pipe. An annular retainer is carried by this end of the housing; a resilient elastomeric sealing member is carried by the retainer. This sealing member engages the exterior of the pipe in such a manner as to form a seal against the pipe, and in such a manner as to permit the plate to be adjusted relative to the pipe so as to fit against either a flat roof or a roof at any commonly used pitch. The plate, the housing and the retainer are preferably formed integrally with one another out of a sheet of ABS material laminated to a surface covering of a degradation resistant acrylic composition.

2 Claims, 3 Drawing Figures



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Opposition No. 91182064

ALP00285

FIG. 1.

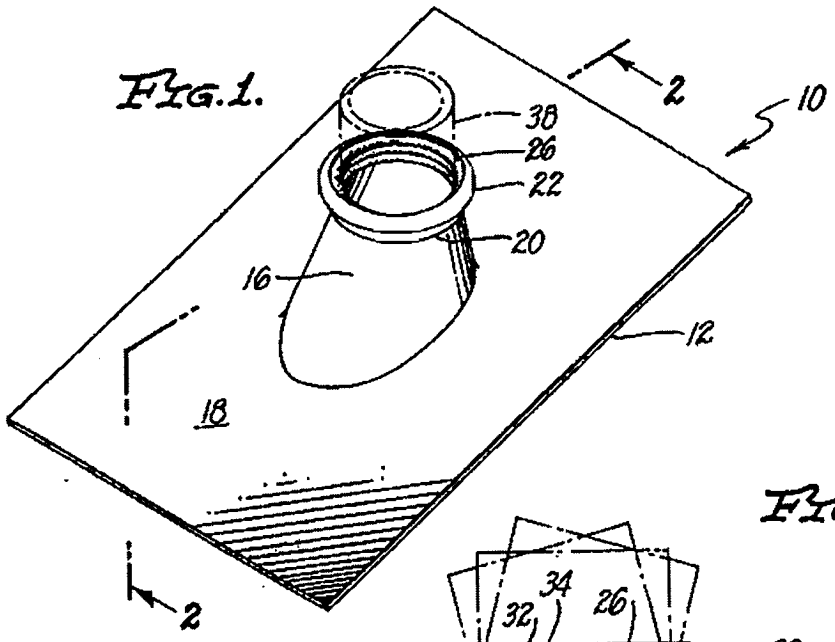


FIG. 2.

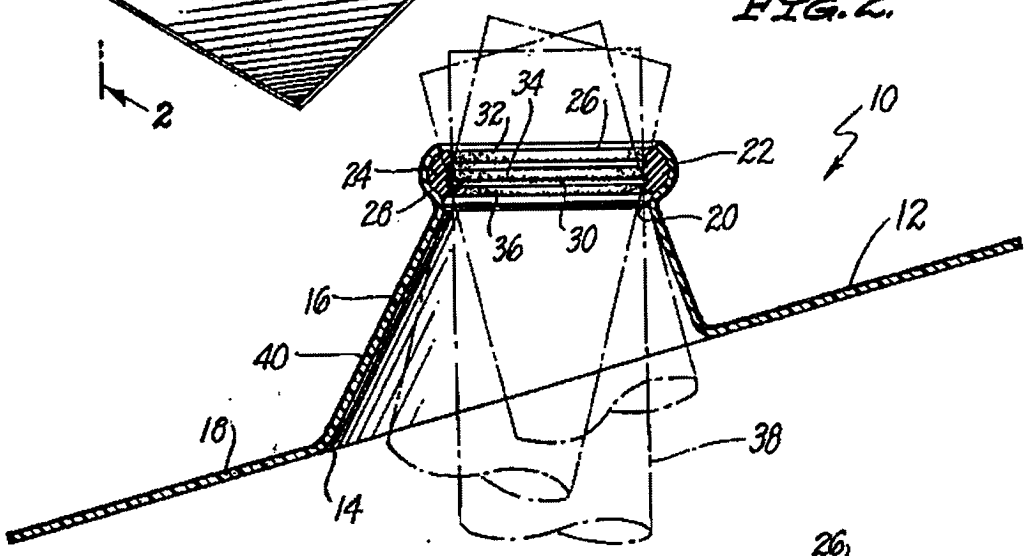
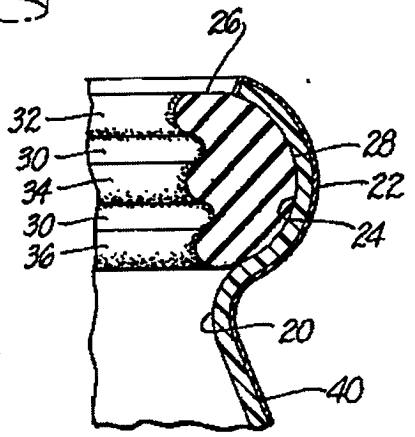


FIG. 3.



ROOF FLASHING STRUCTURE

BACKGROUND OF THE INVENTION

The invention set forth in this specification pertains to new and improved roof flashing structures for use on a roof so as to form a seal around a pipe extending through the roof.

The term "flashing" is commonly utilized in the building trade to designate pieces of sheet metal or the like used to cover and protect various types of joints. Various different specific flashing structures are commonly utilized in covering and protecting different types of joints. Thus, for example, it has been commonplace to utilize flashing structures for covering and protecting joints between a roof and a vent pipe or the like which have been constructed so as to utilize a flat plate or sheet of material carrying an upstanding flange adapted to fit around the exterior of such a pipe. Normally the flange in such a structure is sealed to such a pipe by a calking type composition. At times such sealing compositions are referred to as mastics.

Specialized roof flashing structures as indicated in the preceding paragraph are commonly recognized to have certain limitations. Normally such structures can only be utilized with a roof located at a specific angle to a pipe extending through the roof. This is disadvantageous because it necessitates the maintenance of an inventory of different flashing structures for use with different roofs which are flat or are sloped at various different angles. Roof flashing structures as indicated are also considered disadvantageous because of the use of the compositions which are employed to form a seal between them and a pipe. In general such compositions tend to be somewhat messy, difficult and time consuming to apply. Further, such compositions will frequently tend to crack and/or deteriorate after prolonged use. This, of course, will result in either leakage or the possibility of leakage.

SUMMARY OF THE INVENTION

It is believed that it will be apparent from the preceding that there is a need for improvement in the field of roof flashing structures and more specifically in connection with roof flashing structures which are utilized around pipes such as vent pipes. A broad objective of the present invention is to fulfill this need. The invention is also intended to provide roof flashing structures as indicated which can be constructed at a comparatively nominal cost, which can be easily and conveniently installed and which are capable of giving prolonged, reliable service. While all of these items are important it is considered that the cost of installing roof flashing structures of the present invention makes them particularly desirable as compared to prior structures.

In accordance with this invention these various objectives are achieved by providing a roof flashing structure for use on a roof so as to form a seal around a pipe extending through the roof which comprises: a generally flat, imperforate plate adapted to overlie and fit against a roof, this plate having a centrally located opening of larger dimension than the pipe formed therein, an upstanding, imperforate housing located on one side of the plate so as to extend outwardly from this side of the plate, this housing extending around the opening and having an open end of larger dimension than the pipe located remote from the plate, an annular retainer means for holding a sealing member located on this end of the housing, this retainer means being capable of fitting around the exterior of the pipe, and a resilient, elastomeric sealing member held by the retaining means and extending from the retainer means towards the interior of the retainer means, this sealing member being capable of resiliently engaging the exterior of the pipe when the pipe extends through the opening, the housing and the retainer means so as to form a seal against the exterior of the pipe.

BRIEF DESCRIPTION OF THE DRAWING

The invention is best more fully described with reference to the accompanying drawing in which:

FIG. 1 is an isometric view of a presently preferred embodiment of a roof flashing structure in accordance with the invention in which a vent pipe is shown in phantom;

FIG. 2 is a cross-sectional view taken at line 2—2 of FIG. 1 in which the vent pipe illustrated in phantom in FIG. 1 is illustrated as extending vertically and in which alternate manners in which the vent pipe can extend are indicated in phantom at an angle to the vertical; and

FIG. 3 is an enlarged, fragmentary cross-sectional view corresponding to a part of FIG. 2.

The roof flashing structure illustrated in the drawing embodies the concepts of this invention set forth and defined in the appended claims. These concepts may be easily utilized in other somewhat differently appearing roof flashing structures through the use or exercise of routine engineering skill.

DETAILED DESCRIPTION

The roof flashing structure 10 illustrated in the accompanying drawing includes a generally flat plate 12 which is adapted to overlie and fit flat against a roof (not shown). This plate 12 has a centrally located opening 14. An upstanding housing 16 is attached to the plate 12 around the periphery of the opening 16 so as to extend upwardly from an upper surface or side 18 of the plate 12. This housing 16 is of a generally tapered shape and has its largest dimension adjacent to the plate 12; it terminates in an open end 20 which is located remote from the plate 12. This end 20 is attached to and carries a retainer ring 22 located so as to be positioned on the end 20 generally away from the plate 12.

The interior of this ring 22 is formed so as to include an inwardly directed groove 24 which extends completely around the interior of the ring 22. This groove 24 has a curved, circular cross-sectional shape as shown. The groove 24 is used to hold an annular or ring-like elastomeric, resilient sealing member 26 having an outer surface 28 which conforms to the interior shape of the groove 24. The interior 30 of the sealing member 26 is provided with a plurality of inwardly projecting sealing flanges 32, 34 and 36, each of which is of a partially circular cross-sectional configuration. These flanges 32, 34 and 36 successively decrease in internal dimension or diameter in such a manner that the flange 36 located closest adjacent to the plate 12 is the flange 36 located closest adjacent to the plate 12 is the largest of these flanges.

When the structure 10 is to be utilized it is assembled with the sealing member 26 in the retainer 22 as shown. The structure 10 can then be brought down upon a vent pipe 38 as is shown in phantom in FIG. 1. The successive changes in internal dimensions of the sealing

flanges 36, 34 and 32 facilitate the structure 10 being pulled to an operative position in this manner. These flanges 32, 34 and 36 are dimensioned so that all of these flanges will resiliently engage the vent pipe 38 as the structure 10 is assembled in this manner so as to each form a seal against the exterior of the pipe 38.

When the structure 10 is moved in this manner it will normally be moved along the pipe 38 until such time as the plate 12 hits against a roof. The structure 10 can then be twisted on the pipe 38 so that the pipe 38 extends through it in any of the manners shown in phantom in FIG. 2 so as to permit the plate 12 to be located against either a flat roof or a roof constructed at any common angle to the horizontal. Thus, the plate 12 can be located at a right angle to the pipe 38 or at a plurality of other angles relative to this pipe 38.

In order to achieve this mode of operation the opening 14, the end 20 and the retainer ring 22 must all be constructed so as to be larger than the vent pipe 38 with which the structure 10 is to be used. Further, the housing 16 must be tapered in the manner indicated so as to accommodate the pipe 38 being located relative to the structure 10 in any of the manners indicated. The shape of the groove 24 and of the sealing member 26 are both considered to facilitate seals being formed against the exterior of the pipe 38 in all positions of this pipe.

Although the structure 10 can be constructed from a number of different materials in a number of different ways it is presently preferred to construct the structure 10 so that all parts of its except the sealing member 26 are integral with one another and are imperforate. When the structure 10 is constructed in this manner and is used as described only a very limited amount of the sealing member 26 is exposed to ambient conditions such as might cause degradation of the material in the sealing member 26. This is considered important in enabling the structure 10 to be utilized over a prolonged period. If for any reason such degradation shall commence and shall affect the uppermost sealing flange 32 the other sealing flanges 34 and 36 will still remain operative for their intended purpose.

It is preferred to manufacture the entire structure 10 except for the sealing member 26 of a polymer material which will not rust or corrode in use. It is considered that preferred results can be achieved when such a body is formed of a common ABS polymer composition covered with a thin acrylic layer 40 which is laminated in place by thermal means. Such as ABS polymer body is, of course, though and rigid since ABS material itself is relatively tough and rigid. Such an acrylic layer 40 is much more resistant to normal ambient conditions than ABS material and, hence, enables the structure 10 to be satisfactorily employed over a prolonged period.

Unquestionably the latter is quite important as far as the utility of the present invention is concerned. It is, however, considered secondary to the ease of installing a structure 10 in an operative location. It is considered that considerable labor savings can be achieved in installing the structure 10. This structure 10 is of such a nature that it does not require the use of caulking or mastic type compositions. Hence, it avoids the steps of using such compositions in installing the roof flashing structure. This structure 10 also avoids cracking and other related problems frequently encountered with caulking or masking compositions.

The utility of the structure 10 can be improved by making the layer 40 at the upper surface 18 of a textured or irregular surface configuration. Such a roughened surface configuration is considered desirable because hot tar and other compositions such as are commonly employed in roofing will adhere to such a roughened surface more easily than to a smooth surface.

I claim:

1. A roof flashing structure for use on a roof so as to form a seal around a pipe extending through the roof which comprises:

a generally flat, imperforate plate adapted to overlie and fit against a roof, said plate having a centrally located opening of longer dimension than said pipe formed therein,

an upstanding, imperforate, tapered housing located on one side of said plate so as to extend outwardly from said side of said plate, said housing extending around said opening, said housing having an open end of larger dimension than said pipe located remote from said plate, said housing being of its largest dimension adjacent to said plate,

an annular retainer means for holding a sealing member located on said open end of said housing, said retainer means being capable of fitting around the exterior of said pipe, said retainer means comprising a ring, the interior of said ring having an inwardly facing groove formed therein, said groove having a curved, circular cross-sectional shape and extending completely around the interior of said ring, and

said plate, said housing and said retainer means being integral with one another and being formed of a rigid material,

a resilient, elastomeric sealing member held by said retainer means and extending from said retainer means towards the interior of said retainer means,

said sealing member having an outer surface conforming to the interior shape of said groove and including a plurality of separate sealing flanges extending therefrom toward the interior of said sealing member, each of said sealing flanges being capable of separately engaging said pipe,

said retainer means and said housing being of sufficient dimension so as to permit said plate to be positioned at a right angle to said pipe and at a plurality of other angles to said pipe,

said sealing member projecting inwardly from said retainer means a sufficient distance and being sufficiently flexible to form a seal with said pipe in all positions of said plate relative to said pipe.

2. A roof flashing structure as claimed in claim 1 wherein:

said flanges have successively decreasing internal diameter, the one of said flanges closest to said plate having the largest internal diameter of any of said flanges, the one of said flanges furthest from said plate having the smallest internal diameter of any of said flanges,

each of said flanges having a curved extremity extending toward the interior of said sealing member.

* * * * *

United States Patent [19]

Resech

[11] **4,211,423**

[45] **Jul. 8, 1980**

[54] **ROOF SEAL DEVICE**

[75] Inventor: **Raymond W. Resech, La Grange Park, Ill.**

[73] Assignee: **Portals Plus, Inc., La Grange Park, Ill.**

[21] Appl. No.: **974,435**

[22] Filed: **Dec. 29, 1978**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 881,186, Feb. 27, 1978, abandoned.

[51] Int. Cl.[2] F16J 15/02; E04D 13/14

[52] U.S. Cl. ..... 277/212 FB; 285/4; 285/42; 277/1; 277/12

[58] Field of Search ..... 277/1, 12, 212 FB; 285/3, 4, 42-44

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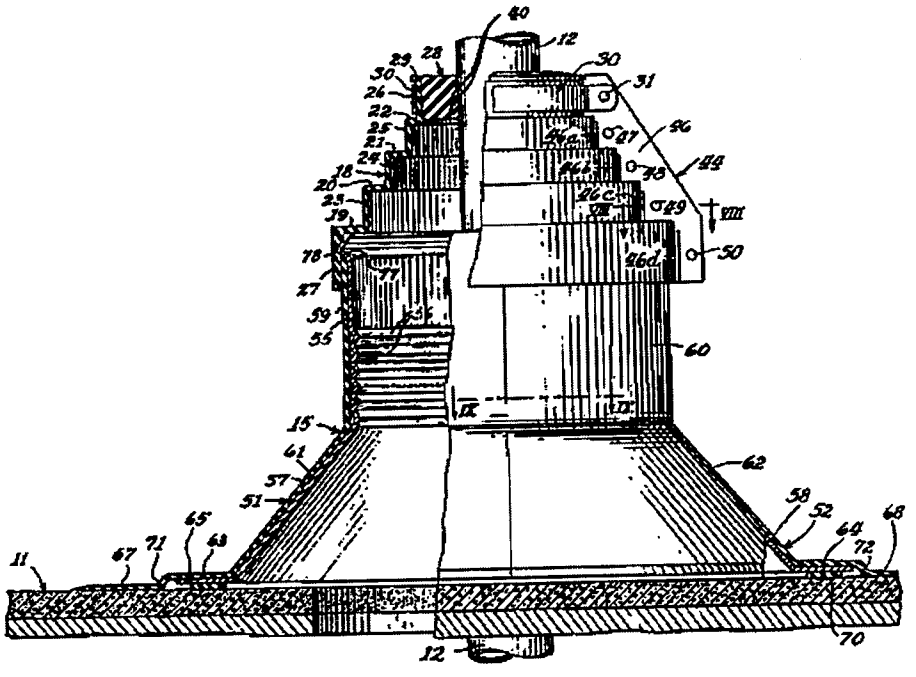
Primary Examiner—Robert S. Ward, Jr.

Attorney, Agent, or Firm—John C. Brezina; Van Metre Lund

[57] **ABSTRACT**

A device is provided including a pair of base sections adapted to be joined together along a generally vertical plane in approximate alignment with a pipe or other object extending through a roof or supported therein, such sections including a pair of molded plastic-supporting parts and a pair of skirt parts of elastomeric material which have overlapping edge portions and which define a downwardly facing surface secured by an adhesive to the upper surface of roofing material to provide a permanent weathertight seal. A split boot is secured to the upper end of a tubular portion of the base sections and is of a stepped, severable construction for accommodating pipes or other objects of various larger sizes. Lips at the split of the boot are secured together by a channel-shaped metal clip. For smaller objects, a split plug is secured on the upper end of the split boot and has inwardly facing annular serrations for sealing engagement with an object. A multi-purpose adaptor plug is also provided for use with a variety of shapes, sizes and orientations of objects.

16 Claims, 14 Drawing Figures



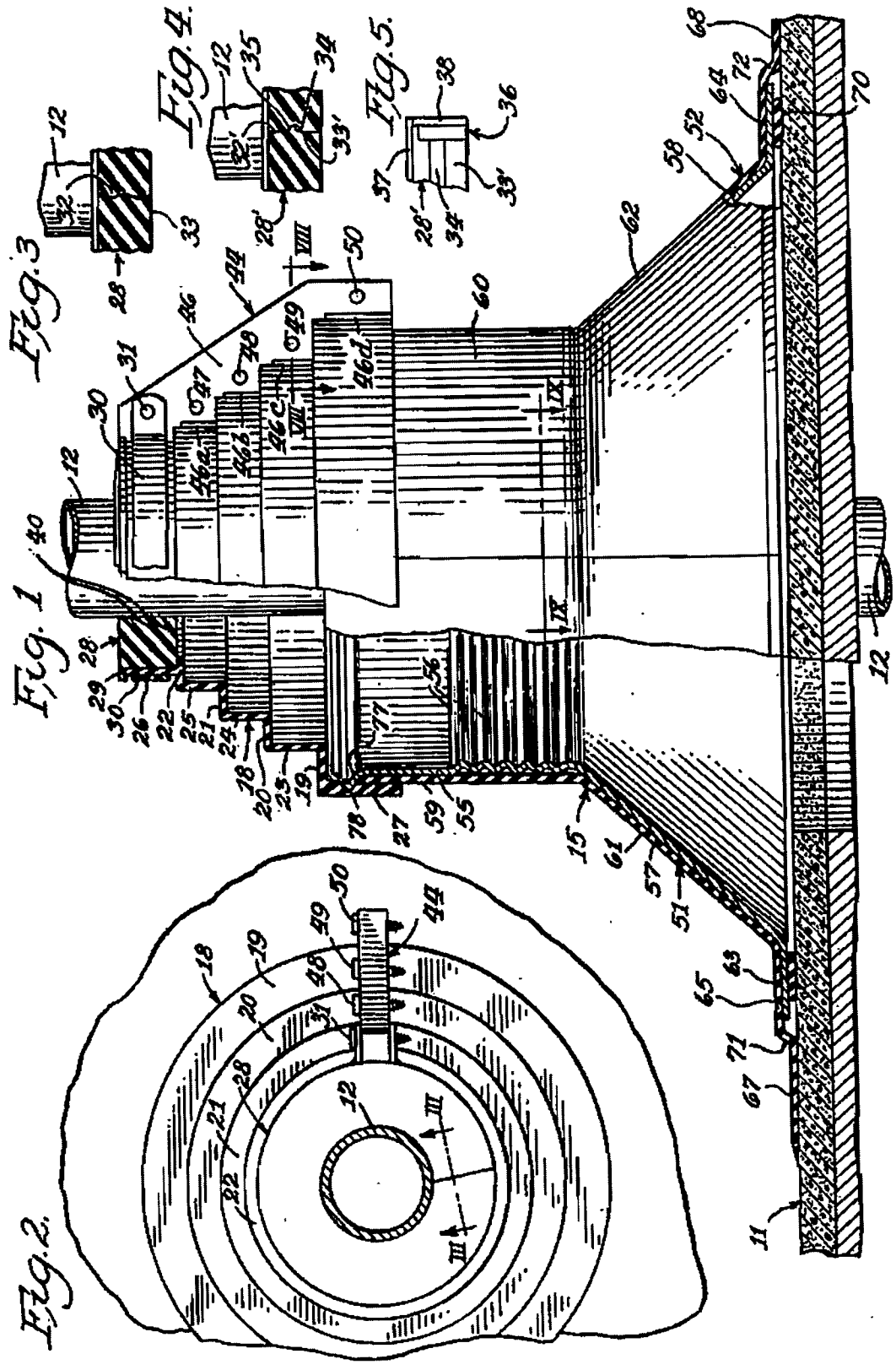


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

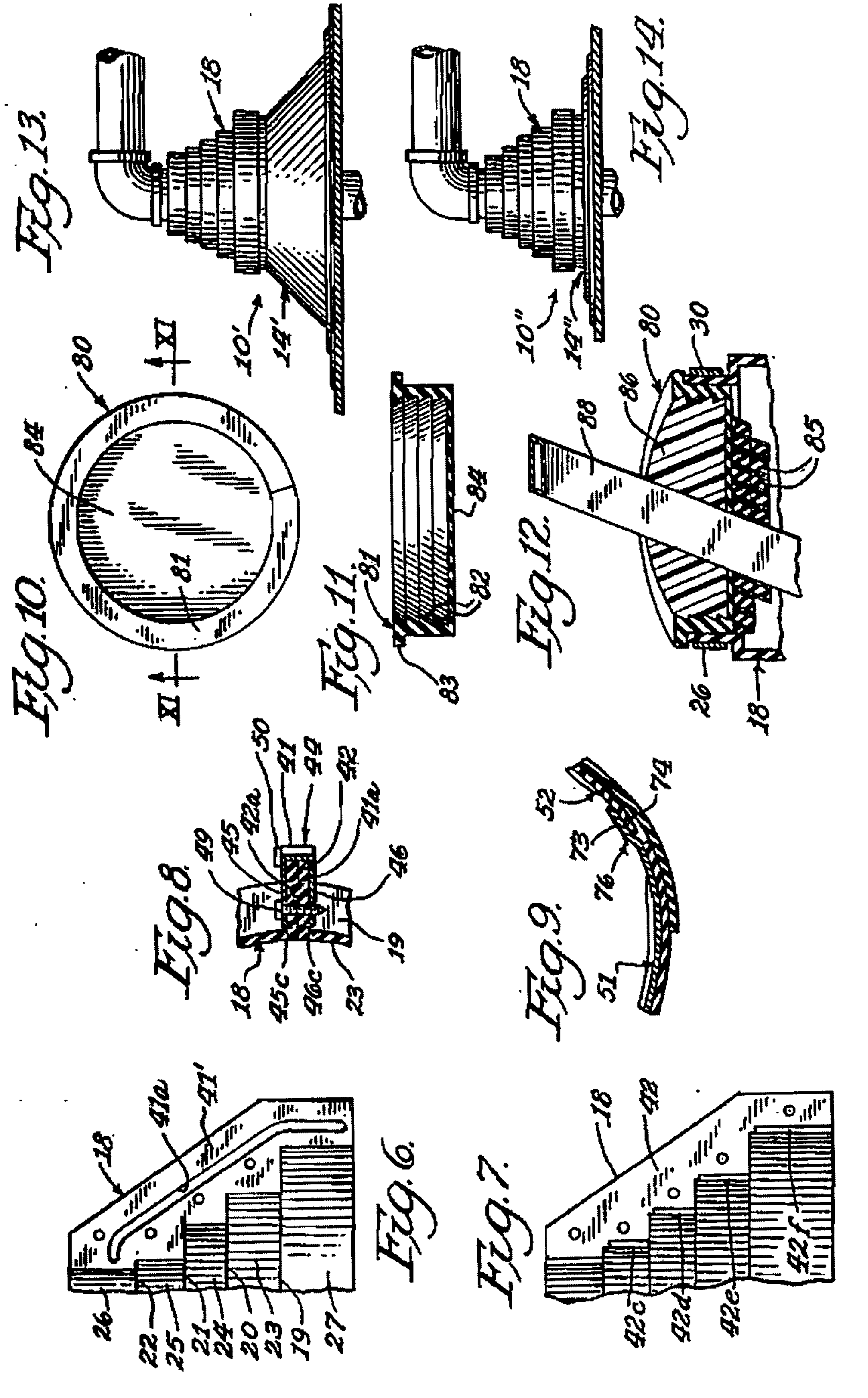


Fig.13.
Fig.14.
Fig.10.
Fig.11.
Fig.12.
Fig.8.
Fig.9.
Fig.6.
Fig.7.

ROOF SEAL DEVICE

This application is a continuation-in-part of my copending application, Ser. No. 881,186, filed Feb. 27, 1978, now abandoned.

This invention relates to a roof seal device and more particularly to a device for providing a seal on a roof around a pipe or other object extending through a roof or supported therein. The device is adapted for use in extending pipes through existing roofs as well as in new constructions and is easily installed while providing a permanent weathertight seal.

BACKGROUND OF THE PRIOR ART

Under present roofing practices in which a pitch pocket is used to seal a pipe to a roof opening, leaks are quite common and there is a very high percentage of leaks within the first six months after installation. Sealants crack or run off because of ever-changing weather conditions. Pipe and roofing materials expand and contract with temperature changes and there are also relative movements such as vibrations from wind and/or machinery. If oftentimes happens that leaks are not discovered until after substantial damage has occurred, making major repairs necessary.

Roof curb devices have been provided for obtaining a proper seal but have generally be designed for new construction or during installation of a new roof and they are difficult to install and not at all suitable for extending a pipe through an existing roof.

SUMMARY OF THE INVENTION

This invention was evolved with the general object of overcoming the disadvantages of prior art sealing methods and devices and of providing a device which will provide a permanent weatherproof seal and which is readily installed in both existing and new construction.

In accordance with this invention, a pair of complementary base sections are provided, each including a support part of a molded, strong and substantially rigid plastic material and a skirt part of a flexible elastomeric material on the support part. The sections are arranged to be secured together along a generally vertical plane through a roof opening and together they provide an upstanding tubular portion and a peripheral flange portion with the skirt parts providing a downwardly facing surface engageable with the upper surface of roofing material about a pipe or other object extending through a roof or supported therein. An adhesive material bonds such engaging surfaces together and a permanent weatertight seal is provided.

The flexibility of the skirt parts promotes conformity to irregularities in the upper surface of the roofing material and also allows for relative expansions and contractions such as those due to temperature changes. Preferably and in accordance with a specific feature, the skirt parts are formed with offsets in a manner such as to provide an annular wall portion outside the periphery of the support parts, for additional flexibility.

Another specific feature relates to the provision of sections of adhesive material on the undersides of the edges of the support parts for holding the skirt parts on the roof during application of an adheaive between the peripheries of the skirt parts and the roof surface.

Seal means are secured to the upper end of the upstanding tubular portion defined by the base sections,

preferably including a split boot of flexible elastomeric material which is most preferably of a stepped, severable construction for accommodating pipes or other cylindrical objects of various larger sizes. For objects of smaller sizes, a split annular plug is secured on the upper end of the boot, the plug having an opening of a size matched to that of the small object to be sealed and serrated tooth formations are provided in such opening.

Important features of the invention relate to the construction of the split boot and to the manner of installing the boot on the base sections. A pair of lip portions are provided at the split of the boot and are pressed together by a clip of generally channel-shaped configuration which is preferably formed with notches to conform to the stepped configuration of the boot and which is severable according to the size of the pipe.

In accordance with a specific feature, the clip is formed with tooth portions which bite into grooves in the lip portions in a manner and as to insure a highly reliable sealed connection.

Additional features relate to the construction of the plug which includes an outwardly extending annular flange or in an alternate construction, it includes a downwardly facing annular groove receiving an uppermost tubular portion of the stepped boot with tongue and groove means and overhanging flap means being provided at the split of the plug.

Another very important feature relates to a multipurpose adaptor plug which is so arranged as to receive a mastic and to provide a seal around an object or a plurality of objects of a variety of configurations. It may be used for example, for a plurality of pipes, one or more angle irons or for square tubes, objects extending at angles, etc.

Still another feature relates to the provision of annular ribs on the inside of the tubular portion of the base for engagement with the outside of a sheet metal chimney which may be nailed to a roof in new constructions. The device is thus suitable for installation during new construction as well as on existing roofs and can accommodate pipes of a wide range of sizes. It should be understood that the device can be used in conjunction with any elongated object similar to a pipe and the term "pipe" is used herein in a generic sense to include any equivalent type of object.

This invention contemplates other objects, features and advantages which will become more fully apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in section, illustrating a device constructed according to the invention installed on a roof to provide a seal to a pipe;

FIG. 2 is a top plan view of the device;

FIG. 3 is a sectional view taken substantially along line III—III of FIG. 2 and showing an interface at the split of a plug of the device;

FIG. 4 is a view similar to FIG. 3, showing an alternative construction;

FIG. 5 is a view of one face of the split of the alternative plug construction of FIG. 4;

FIG. 6 is a view illustrating an inner face of one lip portion of a split boot of the device;

FIG. 7 is a view illustrating an outer face of a second lip portion of the split boot of the device;

FIG. 8 is a sectional view taken substantially along line VIII—VIII of FIG. 1.

FIG. 9 is a sectional view taken substantially along line IX—IX of FIG. 1.

FIG. 10 is a top plan view of a multi-purpose adaptor plug according to the invention;

FIG. 11 is a sectional view taken substantially along line XI—XI of FIG. 10;

FIG. 12 is a perspective view, partly in section, illustrating how the adaptor plug of FIGS. 10 and 11 is used and installed;

FIG. 13 is a side elevational view illustrating a modified base configuration which has an intermediate height profile; and

FIG. 14 is a side elevational view illustrating another modified base configuration which has a low profile.

DESCRIPTION OF A PREFERRED EMBODIMENT

Reference numeral 10 generally designates a roof seal device constructed in accordance with the principles of this invention, and shown installed on a roof 11 to provide a seal to a pipe 12 which extends through an opening 13 in the roof 11. The device 10 is designed for installation on an existing roof to replace a defective seal or for installation on an existing roof after extending a pipe through a new opening cut therethrough. It may be used for objects other than pipes, for objects which project upwardly from a roof without extending therethrough. It may also be used in new construction as hereinafter described. Once installed, it provides a permanent waterproof seal.

The device 10 comprises a base generally designated by reference numeral 14 and including a pair of complementary base sections 15 and 16 which are adapted to be joined together along a generally vertical plane in approximate alignment with an object projecting upwardly from a roof, the plane being through the roof opening 13 in the illustrated arrangement. Sections 15 and 16 together provide an upstanding generally tubular portion and a peripheral portion for engagement with the roof surface about the opening therein. Pipe seal means are secured to the upper end of the base and include a split boot 18 of a flexible elastomeric material which preferably has a plurality of annular step portions 19–22 in vertically spaced planes and tubular portions 23–26 progressively smaller diameters joining the inner edge of each of the step portions and the outer edge of the next higher step portion. An additional tubular portion 27 extends around the upper end of the base. The boot 18 is severable along the top edge of a selected one of the tubular portions 23–27 which has a diameter matching that of a pipe within a larger size range, such as from 3½ to 6 inch pipe, for example. For smaller sizes of pipe, a split annular plug 28 is provided.

The plug 28 has an outwardly projecting annular flange 29 which overlies the uppermost tubular portion 26 of the boot 18 and a clamp 30 is disposed around the tubular wall portion 26, a screw 31 being extended through the ends of the clamp 30. As shown in FIGS. 2 and 3, the split of the plug 28 provides two interengaging faces 32 and 33 which are formed on a bias, i.e. at an angle to a radial plane and which are of mating form with alternating grooves and ridges.

In the alternative as shown in FIGS. 4 and 5 a modified plug 28' may be used including a face 32' having a groove 34 receiving a tongue 35 on a face 33'. The modified plug 28' may be formed with a downwardly facing annular groove 36 which receives the uppermost tubular portion 26 of the boot 18, within the clamp. An integral flap portion 37 projects from the upper side of the face 33' and overlies a portion of the plug 28', adjacent the face 32'. In addition, a flap portion 38 is provided on the outside projecting from the outer side of the face 33' and on the outside of a portion of the plug adjacent the face 32'.

Another feature of the plug 28 is in the provision of annular serrations 40 in the central opening of the plug for engagement with the outside surface of the pipe and to improve the sealing action. The serrations are formed by downwardly facing annular surfaces which are at relatively large angles relative to the horizontal and upwardly facing surfaces which are horizontal or at relatively small angles to the horizontal.

It should be noted that the pipe 12 as illustrated is a conventional pipe, but the plug 28 can be used for other types of objects such as angle and channel-shaped members, for example, and the opening in the plug can be shaped as desired or a multi-purpose plug can be used as hereinafter described in connection with FIGS. 10–12. Also, of course, the openings for pipes should have a size corresponding to the outer diameter of the pipe, and, for example, a plurality of plugs may be supplied for pipe sizes of three inches, two and one-half inches, two inches, one and one-half inches, one and one-quarter inches, one inch, three-quarter inch, one-half inch and three-eights inch. The upper face of the plug, as shown, should have a slight pitch.

The boot 18 at the split therein includes a pair of outwardly projecting interengaging lip portions 41 and 42, the portion 41 having a groove 41*a* therein which receives an integral tongue 42*a* formed on the lip 42. The lips 41 and 42 are secured together by a generally channel-shaped clip 44 including side walls 45 and 46 which are formed with notches which register with each other and with the projections formed by the step and tubular portions of the boot. The screw 31, which secures the clamp 30 in place, may also extend through the upper ends of the side walls of the clip 44 and additional screws 47, 48, 49 and 50 have shank portions extended through openings in side wall 45 thence through openings in the lips 41 and 42 and thence into openings in the side wall 46.

An additional feature of the clip 44 is in the provision turned-in portions 45*a*, 45*b*, 45*c* and 45*d* on wall 45 and turned-in portions 46*a*, 46*b*, 46*c* and 46*d* on wall 46 which form teeth engaged in notches in the lip portions 41 and 42. Thus as illustrated in FIG. 7, the outer face of the lip portion 42 is formed with grooves 42*c*, 42*d*, 42*e* and 42*f* receiving the teeth 46*a*, 46*b*, 46*c* and 46*d* and the lip portion 41 is formed with similar grooves receiving the teeth 45*a*–45*d*.

When the boot 18 is severed for use with a larger size of pipe, the clip 44 is correspondingly severed.

The base sections 15 and 16 include supporting parts 51 and 52 which are of molded, strong and substantially rigid plastic material, preferably an acrylonitrite butadiene styrene material, and skirt parts 53 and 54 of a flexible elastomeric material, preferably an ethylene propylene hydrocarbon material. A portion 55 of the supporting part 51 and a corresponding portion of the other supporting part 52 together provide a generally tubular portion of the base and such portions are preferably formed to provide annular rib formations 56 which are provided for engagement with the outside surface of a chimney which may preferably be formed of sheet metal and secured to a roof opening, such being used in new construction. For use on existing construction, the

rib formations 56 do not engage such a chimney device but they are nevertheless advantageous in reinforcing and rigidifying the supporting parts 51 and 52.

The supporting part 51 further includes a portion 57 which together with a corresponding portion 58 of the other supporting part 52 provide a generally frusto-conical support portion.

The skirt parts 53 and 54 include portions 59 and 60 which together define a generally tubular portion surrounding the tubular portion formed by portion 55 of the supporting part 51 and the corresponding portion of supporting part 52. The skirt parts 53 and 54 further include frusto-conical portions 61 and 62 disposed on the outside of portion 57 of part 51 and the corresponding portion 58 of part 52.

In addition, the skirt parts 53 and 54 include portions 63 and 64 disposed against the upper surfaces of outwardly projecting annular flange portions 65 and 66 and parts 51 and 52.

On the outside of the portions 63 and 64, the skirt parts 53 and 54 include peripheral portions 67 and 68 which are bonded to the upper surface of the roof 11 through a suitable adhesive. Prior to installation, an adhesive strip 69 is secured to the underside of the peripheral flange portion 65 of the supporting part 51 and a corresponding adhesive strip 70 is secured to the underside of the corresponding flange portion 66 of the part 52, such adhesive strips being protected by a suitable release paper which is removed prior to installation so that the device can be accurately positioned on the roof, after which the adhesive is supplied between the lower surfaces of portions 67 and 68 of the skirt parts 53 and 54 and the upper surface portions of the roof.

An important feature is in the provision of wall portions 71 and 72 between the portions 63,64 and 67,68 which provide an offset to accommodate the thicknesses of the flange portion 65 and adhesive strip 69 and the corresponding flange portion and adhesive strip on the opposite side. The portions 71 and 72 are also very important in permitting a flexibility such as to accommodate shifts in position as encountered in the extreme temperature and other environmental conditions to which roof structures are subjected.

FIG. 9 shows how edge portions of the two base sections 15 and 16 are secured together. On one side, the supporting part 51 of base section 15 has an edge portion 73 which is offset radially inwardly to extend on the inside of an edge portion 74 of the supporting part 52 of the base section 16. Such edge portions are secured together through a plurality of metal clips one of which is designated by reference numeral 76 in FIG. 9. The clip 76 is of generally S-shaped configuration and the edge portion 73 is lockeld between inner and intermediate portions thereof while edge portion 74 is locked between intermediate and outer portions thereof, such inner, intermediate and outer portions being preferably formed with integral struck-out tooth portions for biting and locking engagement with the edge portions 73 and 74. The same arrangement is used on the other side but with the edge portion of the supporting part 52 being offset inwardly to extend on the inside of the supporting part 51, the supporting parts 51 and 52 thus having the same configuration. Preferably, at least three metal clips are used on each side, one adjacent the top of the generally cylindrical portion of the base, another adjacent the junction between the cylindrical and frusto-conical portions and a third adjacent the lower and outer end of the frusto-conical portion. Prior to assembly each supporting part may carry clips along the edge portion at one side thereof, in position to receive the mating edge portion of the other supporting part.

As shown in FIG. 1, the lowermost tubular portion 27 of the boot 18 has an inwardly facing annular groove 77 which receives an outwardly projecting annular rib or tongue portion 78 of the supporting part 51, a similar annular rib or tongue portion being provided on the other supporting part 52.

When the device is used in connection with extending pipes through or in mounting an object on an existing roof, or in replacing defecting seals around pipes or other objects, the device is preferably provided with the adhesive strips 69 and 70 and with strips of a protective release paper on the undersides of such adhesive strips. As a preliminary step, the roof surface around a pipe or other object to be sealed is prepared to provide a smooth and firm surface with gravel and dirt being swept away in all directions by means of a brush which may be desirable supplied with the device. Also, the two base sections are brought together around the pipe or other object, the edge portions of the supporting parts 51 and 52 being locked together through the clips 76 as above described. Then after removing the strips of release paper from the undersides of the adhesive strips 69 and 70, the base is carefully centered relative to the pipe or other object and is pressed down against the roof, preferably by stepping down on the portions 63 and 64, the adhesive strips 69 and 70 being then effective to securely hold the base in the proper position relative to the pipe or other projecting object.

After so mounting the base, the installer lifts an extending side flap portion of each of the skirt parts 53 and 54 which overlaps a side edge of the other and applies an adhesive between such flap and side edge portion, firmly pressing them together to provide a reliable seal. The user also lifts the peripheral edge portions 67 and 68 of the skirt parts 53 and 54, applies an adhesive between the undersides of such edge portions and the roof surface portions therebelow and then presses the portions 67 and 68 against the roof surface portions to provide a reliable seal.

The boot 18 is then installed and, if desired, an adhesive is applied between interengaging surfaces of the lip portions 41 and 42 after which the clip 44 is installed with the screws 47–50 being inserted and tightened to firmly clamp the lip portions 41 and 42 together.

If the device is used with a pipe or other cylindrical object having a diameter greater than that corresponding to the upper tubular portion 26 of the boot 18, the boot 18 is cut at the upper edge of the appropriate one of the tubular portions 23–25 prior to installation, the clip 44 is also cut at a corresponding level and a clamp similar to clamp 30 is installed around such tubular portion.

If the device is used with a pipe or other cylindrical object having a diameter corresponding to the upper tubular portion 26, the clamp 30 is used to clamp the portion 26 directly to the pipe or other object.

If the device is used with a pipe or other object having a size less than that corresponding to the upper tubular portion 26, the plug 28 is used, being installed in a position as shown after which the clamp 30 is installed with the screw being tightened.

It is noted that the plug 28 may be formed with a central opening having a shape such as to receive projecting objects which do not have cylindrical shapes,

such as square objects, angle irons, etc. It is also possible to use a multi-purpose adaptor plug arrangement as illustrated in FIGS. 10–12, forming an important feature of the invention. An adaptor plug 80 is provided including a split annular wall portion 81 having an outside cylindrical surface engageable with the inner surface of the uppermost tubular portion 26 of the boot 18 and having an internal surface formed with serrations 82 similar to the serrations 40 of the plug 28. An integral projecting annular flange 83 is provided, similar to the flange 29 of the plug 28 and for the same purpose.

The adaptor plug 80 additionally has a bottom 84 which may preferably be quite thin. In use, the plug 80 is positioned on the top of the boot 18 and the bottom 84 is cut, with a razor blade for example, to an extent necessary to permit the plug to be fully inserted in the upper end of the boot 18 and around one or more pipes or other projecting objects. After marking the position of the bottom 84 relative to the projecting object or objects, the plug is temporarily removed and, as shown in FIG. 12, a special thick adhesive tape 85 is wrapped around the projecting object or objects at a level such as to provide support for the bottom 84 when the plug 80 is then reinserted in the boot. Next a mastic 86 is applied into the plug to fill the space around the projecting object or objects and within the annular wall portion 81.

In FIG. 12, the projecting object is shown as being a square tube 86 extending at an angle but it will be understood that the arrangement can be used with a wide variety of shapes, orientations and members of projecting objects. It is also noted that the plug 80 is not limited to use in connection with a split boot and split base arrangement as illustrated but may be used with non-split boots as in new construction, for example.

It is noted that the roof seal device 10 as illustrated in FIG. 1 has what may be described as a high height profile which is desirable for most applications but a modified device 10', FIG. 13, having an intermediate height profile may be used in some applications and another modified device 10", FIG. 14, having a low height profile may be used in other applications. Device 10" may be used, for example, in providing a seal around a pipe which projects to an elbow only a short distance above the level of a roof.

In all three devices 10, 10' and 10" the size of the boot 18 is the same and it projects just slightly less than 4 inches above the top of the curb or base 14, 14' or 14". In FIG. 1 the height of the curb or base 14 is 8 inches; in FIG. 13, the height of the base 14' is 5 inches; and in FIG. 14, the height of the base 14" is only 1¼ inches. In both FIGS. 1 and 13, the overall diameter, including the skirt flange portions 67 and 68 is 20.5 inches and in the low profile base 14" of FIG. 14 it is reduced to 13.625 inches it being noted that the low profile base has no frusto-conical portion. These dimensions are given by way of illustrative example and are not to be construed as limitations except that dimensions and proportions of the same order as described and illustrated are of some importance for obtaining optimum use and performance of the devices.

It is noted that in new construction, the base sections may be secured together prior to use and a sheet metal chimney may be nailed to the new roof about an opening therein after which the base may be inserted on the chimney so secured in position. The device is thus extremely versatile, being usable for both existing and new constructions and being adapted to receive pipes or other objects of a wide variety of sizes and configurations.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a device for providing a weather-tight seal on a roof around an object projecting upwardly therefrom, a pair of complementary base sections adapted to be joined together along a generally vertical plane in approximate alignment with said object and together providing an upstanding generally tubular portion for surrounding the object and a peripheral flange portion extending outwardly from the lower end of said tubular portion for engaging the upper surface of roofing material about said object, seal means secured to the upper end of said tubular portion for sealing engagement with said object, each of said complementary base sections including a supporting part of a molded, strong and substantially rigid plastic material and a skirt part of a flexible elastomeric material on said support part, each of said skirt parts having edge portions arranged for overlapping interfitting engagement with edge portions of the skirt part of the other section, said skirt parts having peripheral edge portions together providing a downwardly facing surface adapted to engage an annular portion of the upper surface of roofing material about said object, and an adhesive material for sealing and bonding said downwardly facing surface of said skirt parts to said upper surface of said roofing material.

2. In a device as defined in claim 1, said skirt parts being formed of an ethylene propylene hydrocarbon material adapted to withstand temperatures varying over a wide range and adapted to be sealingly secured through said adhesive to the upper surfaces of roofs including both tarred and shingled roofs.

3. In a device as defined in claim 2, said supporting parts being of an acrylonitrite butadiene styrene material.

4. In a device as defined in claim 1, said pipe seal means including a split boot of a flexible elastomeric material for accommodating relative movements of the pipe and roof due to expansion and contraction from heat and cold and to vibrations.

5. In a device as defined in claim 4, said split boot having a pair of engagable lip portions along the split thereof, and a generally channel-shaped metal closure clip arranged to be pressed into said engagable lip portions to press said lip portions together and to provide mechanical support therefor.

6. In a device as defined in claim 4 for use with a cylindrical object, said split boot having a plurality of annular step portions in vertically spaced planes and tubular portions of progressively smaller diameters joining the inner edge of each step portion and the outer edge of the next higher step portion, said boot being severable along the top edge of a selected tubular portion having a diameter matching that of said object.

7. In a device as defined in claim 6, said split boot having a pair of engagable lip portions along the split thereof, and a generally channel-shaped metal closure clip arranged to be pressed onto said engagable lip portions to press said lip portions together and to provide mechanical support therefor, said clip being severable to match the severence of said boot in matching the diameter of said object.

8. In a device as defined in claim 7, said clip including parallel side walls having registering notches for receiv-

ing and interfitting with said step and tubular portions and being severable at the bottom of each notch.

9. In a device as defined in claim 6, a split annular plug defining a central opening for receiving an object having a transverse dimension less than the diameter of the smallest diameter upper end tubular portion of said boot.

10. In a device as defined in claim 9, said split plug having a downwardly facing annular groove receiving said upper end tubular portion of said boot, having at the split thereof mating radially extending tongue and groove means and overhanging flap means, and having inwardly facing annular serrations in said opening for sealing engagement with the object.

11. In a device as defined in claim 8, said clip having pairs of opposed tooth portions adapted to bite into said lip portions adjacent the outer surfaces of said tubular portions.

12. In a device as defined in claim 1, said supporting parts having outwardly extending peripheral edge portions, adhesive means on the underside of said outwardly extending peripheral edge portion of said supporting parts for securing said supporting parts to said roof, said peripheral edge portions of said skirt parts extending outwardly beyond said peripheral edge portions of said supporting parts for providing said downwardly facing surface of said skirt parts.

13. In a device as defined in claim 12, said skirt parts having portions together defining an annular wall projecting upwardly from inner edges of said peripheral edge portions of said skirt parts on the outside of said peripheral edge portions of said supporting parts.

14. In a device as defined in claim 1, said seal means including a plug having a split annular wall adapted to encircle an object and having a relatively thin bottom wall adapted to be cut for extension of the object therethrough, said plug being adapted to be filled with a mastic material.

15. In a device for providing a weather-tight seal on a roof about an object projecting upwardly therefrom, seal means for providing a seal between the object and the upper end of a tubular portion which surrounds the object, said seal means including a plug having a split annular wall adapted to encircle an object and having a relatively thin bottom wall adapted to be cut for extension of the object therethrough, said plug being adapted to be filled with a mastic material.

16. In a device as defined in claim 15, adhesive tape means adapted to be wrapped around the object below said bottom for support of said bottom during filling of said plug with a mastic material.

* * * * *

United States Patent [19]

Ericson

[11] **4,318,547**

[45] **Mar. 9, 1982**

[54] **DEVICES USED FOR THE CONNECTION OF PIPES**

[76] Inventor: Kurt S. B. Ericson, 48, Prins Boudewijnlaan at B-2230, Schilde, Belgium

[21] Appl. No.: 145,729

[22] Filed: May 1, 1980

[30] Foreign Application Priority Data

May 4, 1979 [BE] Belgium 876033

[51] Int. Cl.³ F16J 9/00; F16J 15/10; F16L 17/00

[52] U.S. Cl. ..... 277/207 A; 277/DIG. 2; 285/3; 285/27; 285/110; 285/177

[58] Field of Search ..... 277/207 A, 9.5, 11, 277/208, 32, 178, 207 R, DIG. 2, 209; 285/3, 4, 24, 27, 177, 110

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Primary Examiner—Robert I. Smith

[57] ABSTRACT

A device for the connection of pipes of whatever section or of pipes with elements forming part of a plant such as housings or tubular bodies of whatever section provided in automatic valves or other apparatus. The device comprises a muff of a flexible material provided on its inner periphery with a tightening membrane in the shape of a lip or of a hat. The device is characterized by cooperation with the lip of guiding or centering means for the pipes to be introduced. The guiding or centering means consist of a piece (6) formed of a series of rings (7, 8, 9) of different sizes which are coaxially maintained in their respective places by cross pieces (10). The outer ring (9) of the centering piece is connected by arms or holders (11) to a fixing collar (ring) (12) which in general is introduced into a groove (13) provided in the interior of the muff.

4 Claims, 4 Drawing Figures

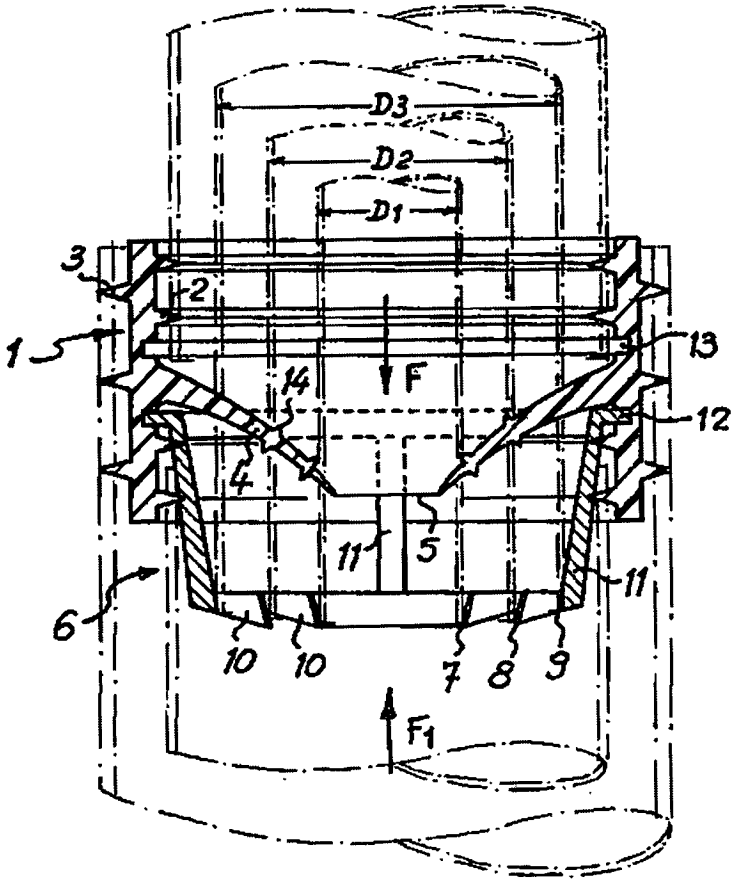
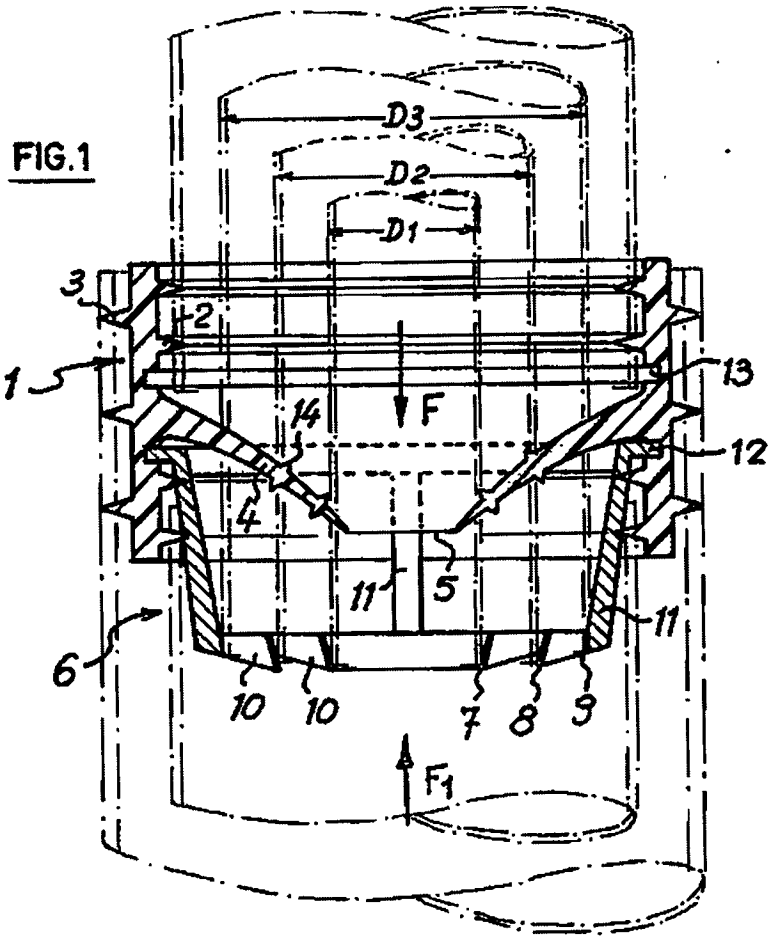


FIG.1



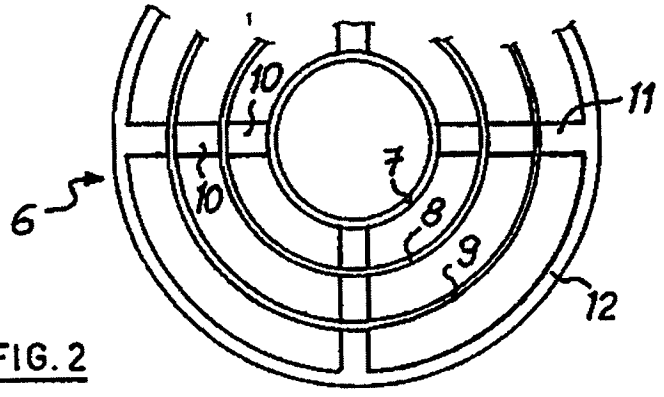


FIG. 2

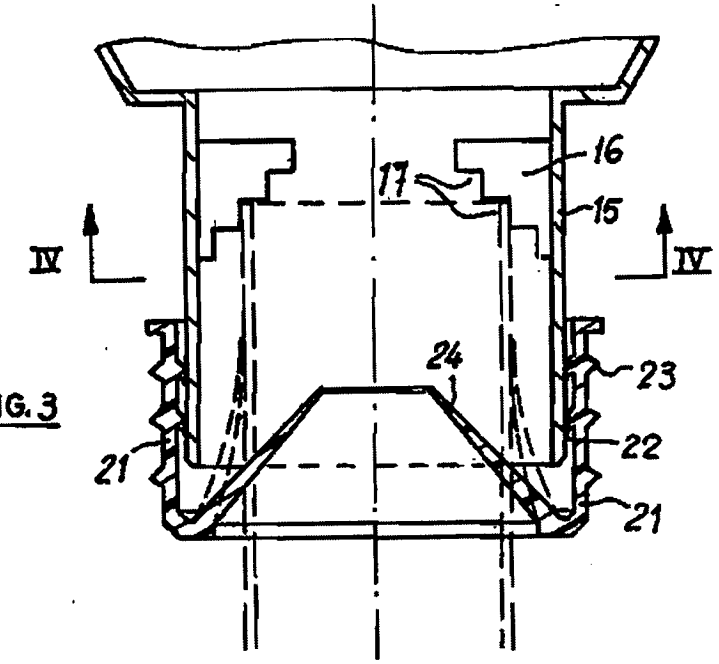


FIG. 3

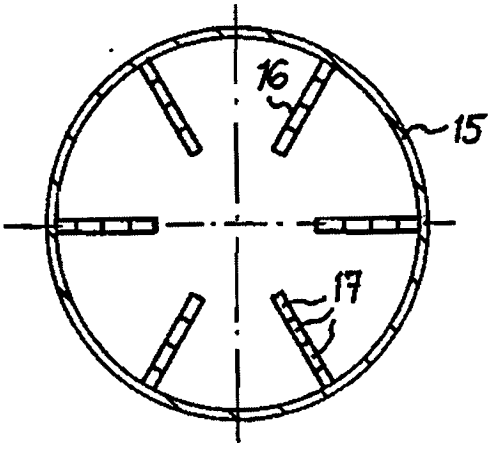


FIG. 4

DEVICES USED FOR THE CONNECTION OF PIPES

The present invention relates to devices for the connection of pipes or of pipes with elements such as housings or tubular bodies provided in automatic valves or other apparatus, for instance, those in conduits for the evacuation of sanitary waste water.

In apparatus of that kind, piping systems for different media (gas, liquids or mixtures) and purposes are constructed to transport these media in different quantities and capacities in the same construction or plant.

Now, use is made of pipes having different dimensions (diameters) and in order to execute connections between pipes there is a need of a big number of pieces or reductions corresponding to the different diameters.

The invention has for its object to give the possibility of connecting a pipe of whatever section or a tubular member having a given size or diameter with pipes or elements of different sizes or diameters by making use of very simple means so as to obtain a connection of an absolute universal type while enabling the obtention of an absolutely efficacious tightness and a perfect guiding or steering of the elements to be connected.

With this object in view, the device making the subject matter of the invention comprises a muff of a flexible material provided on its inner periphery with a tightening membrane in the form of a lip or of a hat, the device being essentially characterized in that with the lip cooperate guiding or steering and centering means for the pipes to be connected.

In the practical embodiment of the invention, there may be provided as guiding means a piece formed of a series of rings of different sizes or diameters which are coaxially maintained one with respect to the other by cross-pieces, the outer ring of the centering piece being connected by arms or holders to a fixing collar or ring which in general is introduced into a groove provided in the interior of the muff.

On the annexed drawings:

FIG. 1 is a cross-sectional view representing as an example a connecting muff with guiding piece.

FIG. 2 is a plan view which represents a guiding or centering piece for a pipe having a smaller diameter than the diameter of the muff.

FIGS. 3 and 4 relate to a special application of the invention.

On FIG. 1 there has been represented a connecting piece formed of a muff or body 1 the inner and outer walls of which are in the example shown provided with peripheral teeth 2–3.

This piece is of a homogeneous flexible material generally of a plastic material.

Inside the body or muff 1 there is a flexible membrane 4 in the form of a lip which by its outer extremity is bodily connected with the inner wall of the muff 1 and which projects towards the longitudinal axis of the muff 1 leaving a central opening 5.

As shown on FIG. 1 in dotted lines, owing to the presence of this membrane it is possible to introduce in the interior of the muff 1 pipes of different diameters (D, D_2, D_3), those diameters being smaller than the inner diameter of the muff 1.

Whatever may be the diameter of the pipe which is introduced the lip 4 becomes deformed and tightly engages the pipe which has been introduced.

Obviously the diameters D_1, D_2, D_3 may have any whatever dimensions.

The muff 1 itself may be introduced in the inside of a pipe having a greater diameter. In this case the teeth 3 provided at the exterior of the muff will give the tightness.

The muff 1 may also be pushed on a pipe having a lower diameter; the inner teeth 2 serve in this case as tightening rings.

However this pushing is limited by the lip 4 situated in substance at the middle of the muff 1.

Due to the teeth 2,3, it is possible to obtain tightening connections taking care of the tolerances and overbridge variations in different norms (ASTH, SIS, ISO, etc.).

According to the invention in order to obtain an efficacious tightening connection between the lip 4 and a pipe of lower diameter, a guiding means for the latter is provided in order to maintain the pipe in an axial position in the muff 1.

In the case of FIG. 1 relating to the connection of pipe between themselves use is made of an element or piece 6 composed of a series of different steering rings 7, 8, 9 of different diameters coaxially maintained one with respect to the other by cross-pieces 10 bodily connected with those rings; the outer ring 9 being connected by arms or holders 11 with a fixing ring or collar 12 introduced into a groove inside the muff 1.

It will be easily understood that if the ring 7 having the smallest diameter is removed with the corresponding cross-pieces 10, for instance by cutting or breaking the same off a pipe of greater diameter (D_2) may be introduced, being guided by the ring 8 of greater diameter.

If a pipe of diameter D_2 is introduced in the device, the lip 4 will produce the tightness and if the pipe is pushed a bit further, it will be guided by the ring 8 corresponding to the diameter D_2.

On the lip 4, inside and outside of the latter, small annular teeth 14 may be provided in order to improve the tightening with respect to the pipe to be connected.

An important feature is that a groove 13 for the reception of the centering piece 6 may exist on each side of the lip 4 so as to enable the positioning of the guiding piece 6 in two different positions and consequently the introduction of pipes from one or the other direction (F or F_1).

As will be understood the invention permits to obtain an absolutely perfect connection due to the tightening elements themselves and to the steering.

Such a connection may be considered as being "universal" in a device such as represented in FIG. 1 comprising a muff 1 with teeth 2–3 and lip 4, whatever may be the diameters.

FIGS. 3 and 4 represent the connection between pipes of different diameters and a tubular body 15 of any whatever section (circular, polygonal, etc.) forming part of a plant of any kind.

A connecting piece 21 executed according to the same principles with teeth 22 on the inside and or teeth 23 on the outside and with a lip 24 is used.

The centering of the inner pipes is obtained in this case by providing on the inner periphery of the tubular body 15, projections 16 (in the number of six in the example) each comprising a staggered portion 17 for the reception of pipes of different diameters.

The connecting devices according to FIGS. 3 and 4 may be advantageously used in automatic valve devices

for sanitary plants for the evacuation of waste water, for example for the valves described and claimed in "U.S. Pat. No. 4,232,706 of the applicant in which there is" made use of a single type of automatic valve for the connection of pipes of different diameters.

What I claim is:

1. A device for connecting tubular elements of different sizes, said device comprising a muff of flexible material provided on its inner periphery with a tightening membrane in the shape of a lip, and guiding or centering means for the tubular elements to be introduced, said means being constituted by a series of rings of different sizes which are coaxially maintained one with respect to the other by cross-pieces, the outer ring of said means being connected by arms to the muff.

2. A device as claimed in claim 1 in which said arms are connected to a fixing ring introduced into a groove on the inner periphery of the muff.

3. A device as claimed in claim 2 in which a groove for the reception of the means exists on each side of the membrane whereby the positioning of the means in two different positions and the introduction of pipes from one or the other direction is rendered possible.

4. Device according to claim 1 in which the inner and/or outer walls of the muff are provided with peripheral teeth in such a manner that when the muff is introduced inside a pipe of a greater or smaller size the outer or inner teeth of the muff respectively are used as tightening rings.

* * * * *

United States Patent [19]

Carlesimo

[11] **4,342,462**

[45] **Aug. 3, 1982**

[54] **ADJUSTABLE SEAL MEMBER FOR CONDUIT TO MANHOLE JUNCTION**

[76] Inventor: John Carlesimo, 29800 W. 8 Mile Rd., Farmington, Mich. 48024

[21] Appl. No.: 59,028

[22] Filed: Jul. 20, 1979

Related U.S. Application Data

[62] Division of Ser. No. 904,426, May 10, 1978, Pat. No. 4,200,299.

[51] Int. Cl.³ F16J 15/10; F16L 25/00

[52] U.S. Cl. ..... 277/101; 277/152; 277/207 R; 277/DIG. 2; 285/4

[58] Field of Search ..... 285/4, 177; 277/207, 277/207 A, 99.5, 101, 152, 27, DIG. 2

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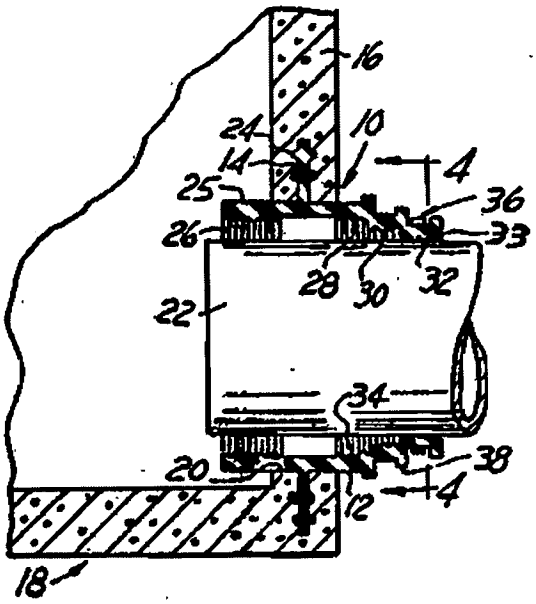
Primary Examiner—Robert I. Smith

Attorney, Agent, or Firm—Hauke and Patalidis

[57] **ABSTRACT**

An adjustable seal member for effecting a leak-proof junction between a conduit and an opening in the sidewall of a manhole well in an underground sewer installation. The seal member, made of elastomeric material, is in the form of a flanged sleeve which is disposed about the periphery of the conduit and which is clamped over the conduit by means of a steel strap clamp. The flange is embedded in the concrete or cement of the manhole well structure in the edge of the opening in the manhole. The sleeve is adjustable to diverse conduit sizes within a range by having a plurality of increasing internal diameter portions for fitting conduits of different outer diameters within the range to insure relatively close fit between the internal surface of the sleeve and the external surface of the conduit. In the alternative, the sleeve is provided with a flap integrally formed with the remaining of the sleeve body and with a pyramidal integral portion which can be folded over to adjust the internal diameter of the sleeve to an appropriate conduit size. The invention further contemplates providing a seal member with a sleeve portion on both sides of the flange for clamping the second sleeve portion over the conduit in the inside of a manhole well.

2 Claims, 13 Drawing Figures



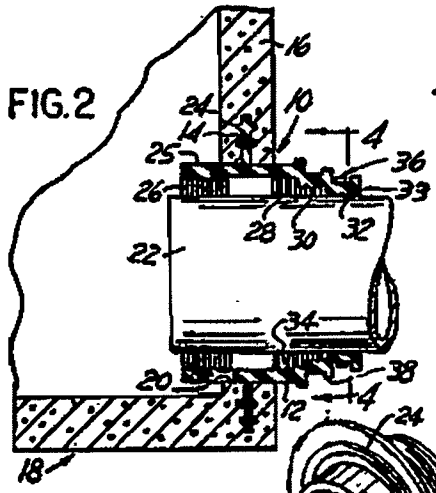


FIG. 2
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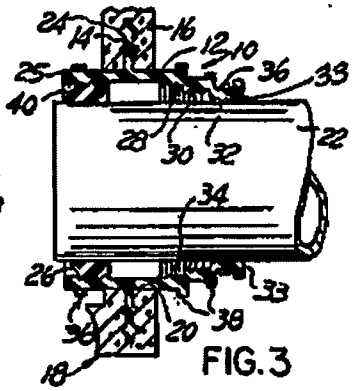
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FIG. 3

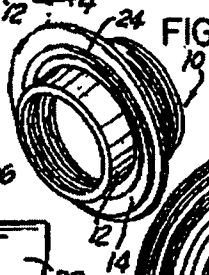
FIG. 1
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12
14

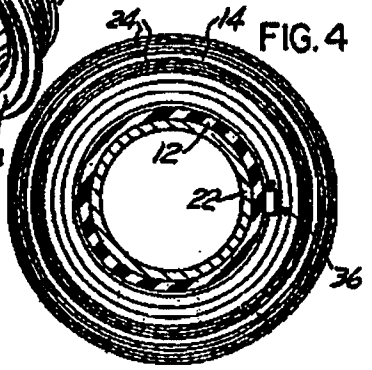
FIG. 4
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14
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22
36

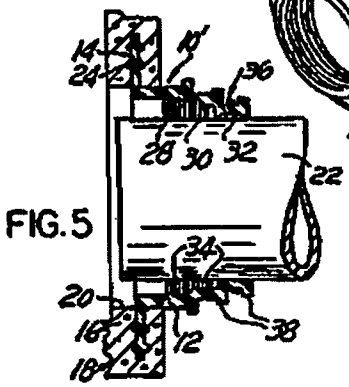
FIG. 5
14
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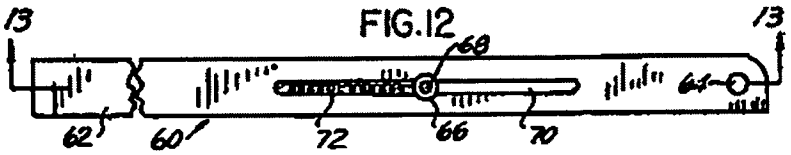
FIG. 12
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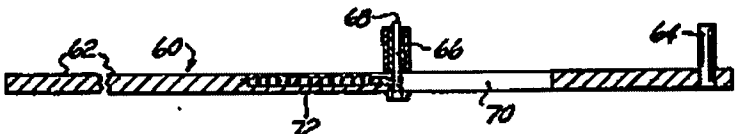
68
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FIG. 13

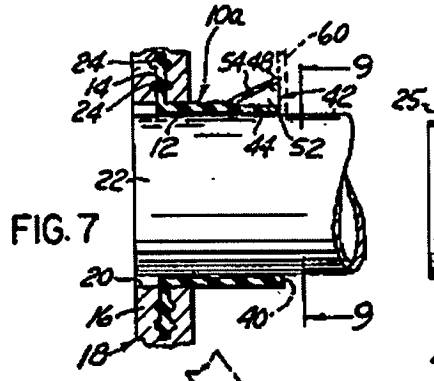

FIG. 7

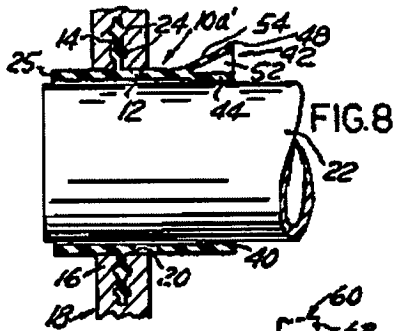

FIG. 8

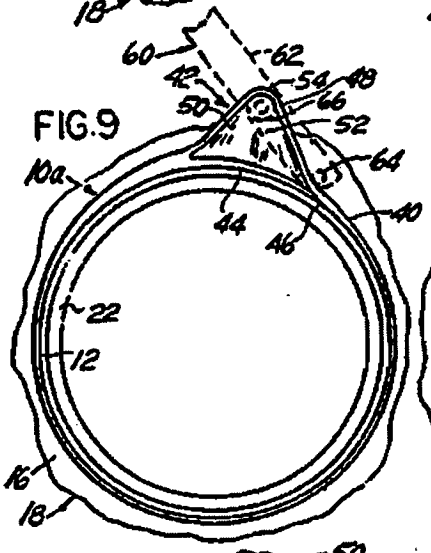

FIG. 9

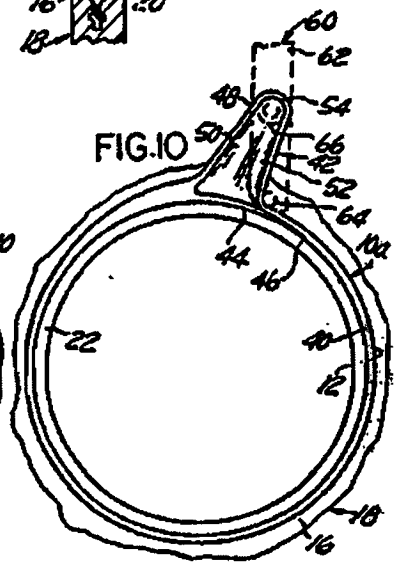

FIG. 10

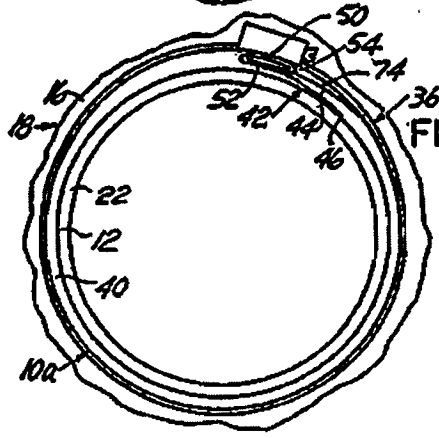

FIG. 11

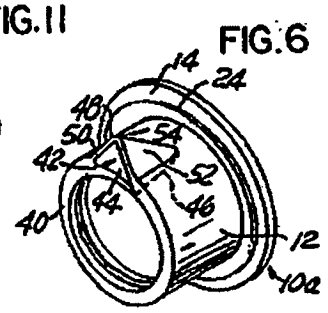

FIG. 6

ADJUSTABLE SEAL MEMBER FOR CONDUIT TO MANHOLE JUNCTION

This is a division of application Ser. No. 904,426, filed May 10, 1978, now U.S. Pat. No. 4,200,299.

BACKGROUND OF THE INVENTION

The invention relates to a seal member for effecting a leak-proof joint between an underground conduit and a structure such as a manhole well.

Different methods have been used in the past for effecting a coupling seal between an underground pipe or conduit and a manhole well provided with an aperture through which the end of the conduit is passed for leading to the interior of the manhole well. Such couplings may be effected by means of a bell-shaped packing or seal closely fitting the peripheral surface of the conduit and partially embedded in concrete or cement poured around the seal at the junction between the conduit and the aperture in the manhole well, or by forcing a packing into the space between the peripheral surface of the conduit and the edge of the aperture. Couplings of this type are disclosed in U.S. Pat. Nos. 2,087,752, 2,657,079, 3,591,190, 3,744,806, 3,787,061, 3,879,067 and 3,348,850.

Another method for effecting a seal between a conduit and a manhole well consists in placing a flanged seal member through the manhole well opening and clamping the flange over the aperture or embedding it in concrete or cement, the sleeve or boot portion of the seal member projecting outwardly from the manhole well opening. The end of the conduit is passed through the sleeve and the sleeve is clamped against the peripheral surface of the conduit by means of a steel strap clamp. A coupling of this type is disclosed in U.S. Pat. No. 3,759,280.

Underground conduits, usually made of clay, concrete, asbestos, plastic, such as polyvinyl chloride, or sometimes cast iron, generally have a rough outer surface, and are subject to wide variations in roundness and in outer diameter size dimensions. Often, conduits of a desired size are not immediately available on the market, and a contractor may be forced to utilize underground conduits of a slightly different outside diameter than the one contemplated.

Furthermore, it often happens that through use and aging, and due to settling of the ground in which an underground sewer system is buried, that bending moments and sheer forces are applied at the joints between the conduits and the manhole well openings causing undesired leakage from the manhole well to the surrounding ground or from the surrounding ground into the manhole well.

SUMMARY

The inconveniences and shortcomings of the prior art are remedied by the present invention which provides an elastomeric seal member forming a junction between a manhole well opening and the conduit fitted to that opening, which is adjustably adaptable to variations in conduit outer diameter sizes for insuring a relatively close fit between the seal member inner surface and the conduit outer surface and which, in a modification thereof, permits to re-establish a leak-proof seal within the manhole well without excavating the ground in the event that the leak-proof joint deteriorates with the passage of time.

The present invention accomplishes its purposes by providing a seal member in the form of a flanged sleeve made of elastomeric material. The flange portion of the seal member, preferably provided with projecting annular ribs, is normally embedded in cement or concrete in the manhole well opening, and is molded integrally with a sleeve portion projecting outwardly of the manhole well structure for clamping by means of a strap or ring clamp about the periphery of the conduit. The sleeve internal diameter progressively decreases in steps and by small increments, such as to provide a relatively close fit with the peripheral surface of conduits of various outer diameter sizes within a range, the smaller diameter portion or portions of the sleeve being removed when it is necessary to accommodate a conduit of an outside diameter corresponding to a larger diameter section of the sleeve. Alternatively, the sleeve is provided with a lip portion, proximate its end, whose diameter is adjustable within a range, as a result of being provided with an integral flap portion and a folded over portion conforming to the diameter of the conduit, after which the flap and the folded over portion, together with the rest of the sleeve lip, are clamped over the conduit by means of a steel strap clamp.

In addition, the present invention contemplates providing a sealing member having an inwardly projecting integral sleeve portion, that is a portion projecting inwardly into the manhole well, permitting to re-establish a leak-proof seal in the event that the portion of the sleeve projecting to the outside of the manhole well becomes damaged, or that the corresponding clamp is damaged, or that, for any other reason, leakage develops.

The many objects and advantages of the invention will become apparent to those skilled in the art when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawing wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an example of conduit to manhole opening seal member according to the present invention;

FIG. 2 is a longitudinal section of the seal member of FIG. 1 illustrated in position in a manhole opening for effecting a seal between a conduit and the interior of a manhole well;

FIG. 3 is a view similar to FIG. 2 but showing the seal member of the invention in use for effecting a seal with a conduit in the inside of a manhole well;

FIG. 4 is a transverse section from line 4—4 of FIG. 2.

FIG. 5 is a view similar to FIG. 2 but showing a modification of the invention;

FIG. 6 is a perspective view of a further modification of the invention;

FIG. 7 is a longitudinal section through the seal member of FIG. 6 illustrated in position in a manhole well opening with a conduit disposed therethrough;

FIG. 8 is a view similar to FIG. 7 but showing a modification thereof;

FIG. 9 is an end view from line 9—9 of FIG. 7 showing the lip of the seal member of FIG. 7 in the process of being tightened about the periphery of the conduit;

FIG. 10 is a view similar to FIG. 9 and showing the relative position of the elements of the seal member with the lip thereof in engagement with the peripheral surface of the conduit;

FIG. 11 is a view similar to FIG. 10 but showing the seal member of the invention clamped about the periphery of the conduit;

FIG. 12 is a plan view of a tool for tightening the lip of the seal member of FIGS. 7–11 about the periphery of a conduit; and

FIG. 13 is a longitudinal section thereof at line 12—12 of FIG. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1–4, a sealing member 10 for a manhole well opening to a conduit seal, according to the present invention, is in the form of a tubular body comprising a sleeve 12, molded of elastomeric material, provided with an integral outwardly flared annular flange 14. As shown at FIGS. 2 and 3 the annular flange 14 of the seal member 10 is normally embedded in the concrete or cement of the wall 16 of a manhole well 18 surrounding an opening 20 through the wall. The end of a conduit 22 is placed through the sleeve 12. In order to provide a good anchorage in the concrete of the manhole well 16, and an effective dam against water seepage, the seal member annular flange 14 is provided with a plurality of concentric ribs 24 on both its faces. One end 25 of the sleeve 12 projects on the inside of the manhole well 18 and is provided internally with parallel ribs 26. The other end of the sleeve 12, that is the end projecting outside of the manhole well 18, is formed with successive step-like integral portions of diameter progressively decreasing by increments, three of which are illustrated in the drawing, as shown at 28, 30 and 32, all preferably also provided internally with parallel ribs 34.

In the configuration illustrated at FIGS. 2 and 3, the outside diameter of the conduit 22 fits the smaller inner diameter portion 32 of the outwardly projecting sleeve portion of the seal member 10, and an adjustable clamp 36, in the form of an adjustable steel band or strap, tightens the lip 33 of the outwardly projecting portion of the sleeve 12 of the seal member 10 about the peripheral surface of the conduit 22. Radially projecting parallel annular ribs 38 may be formed on the peripheral surface of the sleeve 12 proximate the lip 33, each pair of annular ribs corresponding to an internal diameter section 28, 30 and 32, and aiding in holding an appropriate clamping adjustable strap 36 in position.

It is readily apparent that if a conduit 22 having an outside diameter slightly larger than that illustrated in the drawing is used, the smallest diameter portion 32 of the sleeve 12 is cut off, either alone or together with the intermediary diameter portion 30 if necessary, so as to fit properly with a small clearance the peripheral surface of the conduit 22, after which a clamping strap band 36 is placed over the periphery of the sleeve 12 and appropriately tightened.

Once an installation, such as a sewer system consisting of conduits laid in trenches leading from and into diverse manhole wells, has been buried underground and has been operating for a certain period of time under adverse conditions, undesired leakages from the manhole wells to the soil surrounding the manhole wells, or from the soil into the manhole wells may develop. With conventional manhole well openings to conduit sealing devices, when such a leakage occurs it is either ignored or, if it is desired to repair the damages, the ground must be excavated to reach a conduit to manhole well seal, and the seal repaired or changed. The structure of the seal member 10, illustrated at FIGS. 1–3, permits to effectuate such repair without excavating or, in the alternative, it permits to provide each conduit to manhole opening junction with a double seal arrangement when the sewer system is first built. For that purpose, it is only necessary to initially install the conduit 22 through the manhole opening 20 such that the end of the conduit 22 projects within the manhole well 18 a distance corresponding approximately to the distance to which the end 25 of the seal member sleeve 12 projects within the manhole well 18. With a conduit 22 having an outside diameter corresponding substantially to the larger inner diameter portion 28 of the sleeve 12, undesirable leakage is stopped by placing a clamping strap 36 about the periphery of the sleeve 12 proximate its end 25, and tightening the clamp. A second, inner seal is thus effected between the conduit 22 and the seal member 10. In installations using a conduit 22 having an outside diameter corresponding to the inner diameter portions 30 or 32 of the sleeve, an annular gasket 40, FIG. 3, is interposed between the peripheral surface of the conduit 22 and the inner surface of the sleeve 12, proximate its end 25, before tightening the clamping strap 36.

FIG. 5 illustrates a seal member 10' similar to the seal member 10 of FIGS. 1–4, wherein, however, the portion of the sleeve 12 projecting within the manhole well 18 is omitted, the sleeve 12 ending flush with the integral annular flange 14.

The seal members 10a and 10a' illustrated at FIGS. 6–11 are also molded of elastomeric material, have a body forming a sleeve 12 provided with an integral annular flange 14 preferably provided with concentric annular ribs 24 for embedding in the concrete of the wall 16 of a manhole well 18 surrounding an opening 20 in which is disposed a conduit 22. The sleeve 12 projects to the outside of the manhole well 18 around the conduit 22, and is provided with a lip 40 having an adjustable portion 42. The adjustable lip portion 42 comprises an underlying integral flap 44 having a slanted edge 46, FIG. 6, relative to the longitudinal axis of the sleeve 12, which is disposed about a portion of the periphery of the conduit 22, and which is bridged by a continuous portion of the wall of the sleeve 12 forming a pyramidal appendage 48. The integral pyramidal appendage 48 is defined by two integral triangular panels 50 and 52 joined at an apex 54 rearwardly tapering towards the peripheral surface of the sleeve 12.

For the purpose of applying the lip 40 and the corresponding inner surface of the sleeve 12 firmly against the peripheral surface of the pipe 22, a tool 60, illustrated in detail at FIGS. 12–13, is used for folding over the pyramidal appendage 48. The tool 60 comprises a steel bar 62 provided with a fixed pin 64 at one end and a longitudinally displaceable rotatable roller 66 proximate that end. The roller 66 is mounted on a support shaft 68 longitudinally slidable in a slot 70 and constantly pulled away from the pin 64 by a coil spring 72. In use, and as schematically illustrated at FIGS. 9–10, the roller 66 of the tool 60 is placed within the pyramidal appendage 48 on the inside of the apex 54 thereof, the pin 64 is engaged with the outer surface of the triangular panel portion 52 at its junction with the remaining of the body of the sleeve 12, as shown at FIG. 9, and the end of the bar 62 of the tool 60 is pulled clockwise to fold the triangular panel 50 over the triangular panel 52 while pulling the interior surface of the sleeve 12 proximate the lip 40 thereof in tight engagement with

the peripheral surface of the conduit 22, the pulling pressure being dependent on the leverage exerted by the length of the bar 62 and the strength of the spring 72. Once the triangular panels 50 and 52 are folded over one another, the flap 44 and the internal surface of the sleeve 12 proximate the lip 40 are in tight engagement with the peripheral surface of the conduit 22, and one or more clamping straps 36, FIG. 11, are tightened around the periphery of the sleeve 12. The inner surface of the strap of the clamp 36 is preferably provided with a wedge element 74 integral therewith, or a separate wedge member 74 is placed below the strap so as to fill the wedge-shaped space between the apex 54 of the folded over triangular panels 50 and 52 and the peripheral surface of the sleeve 12 proximate the lip 40.

It can thus be seen that the seal member 10*a* of FIGS. 6–11 has a lip 40 which is adjustable to diverse conduit outside diameters, within a range. If it is desired to provide the seal member 10*a* with the added feature of permitting to re-establish a leak-proof seal from the inside of a manhole well, the sealing member structure 10*a'* of FIG. 8 is used, having a sleeve 12 with a portion having an end 25 projecting through the manhole well opening 20 to the interior of the manhole well 18, such that a clamping strap, not shown, can be placed over the periphery of the sleeve 12 on the inside of the manhole well, proximate the end 25 of the sleeve and tightened to effectuate a sealing engagement between the internal surface of the sleeve proximate the end 25 and the periphery of the portion of the conduit 22 projecting within the manhole well 18, without or with a gasket interposed, as the case may be depending on the outer diameter of the conduit 22.

It will be appreciated that the outwardly flared annular flange 14 of every embodiment of the invention may be clamped over the surface of the wall 16 of the manhole well 18 surrounding the opening 20, either on the inside or on the outside of the manhole well by means of an appropriate clamping ring and appropriate studs and nuts, not shown, instead of being embedded in concrete or cement as described and illustrated.

Having thus described the present invention by way of examples of structural embodiments thereof, modification whereof will be apparent to those skilled in the art, what is claimed as new is as follows:

1. In a junction between a manhole well and a conduit having a generally cylindrical peripheral surface and an end disposed within an opening in a wall of said manhole well projecting within said manhole well, a one-piece seal member having a substantially cylindrical tubular body of elastomeric material comprising a sleeve having a first end portion projecting outwardly from said opening in clamped sealed relationship to the peripheral surface of said conduit and an integral outwardly flared annular flange in sealing engagement with the edge of said opening, wherein the first end portion of said sleeve in clamped sealed relationship to the peripheral surface of said conduit has an internal diameter adjustable within a range to conform to the outer diameter of said conduit, said first end portion of said sleeve comprising a plurality of contiguous integral stepped annular portions of decreasing external and internal diameters from proximate said flange to the end of said end portion, a plurality of substantially parallel annular ribs peripipherally integrally formed on said end portion, each pair of adjacent ribs corresponding to one of said decreasing external and internal diameter annular portions and defining a holding means therebetween for an adjustable strap clamping said end portion to the peripheral surface of said conduit and a plurality of circular parallel ribs integrally formed on the internal surface of each of said stepped portions, said sleeve further comprising a second end portion projecting within said manhole well surrounding the end of said conduit projecting within said manhole well, and means for clamping said sleeve second end in sealed relationship to the peripheral surface of said end of said conduit projecting within said manhole well.

2. The seal member of claim 1 wherein said means for clamping said sleeve second end comprises an adjustable strap clamping said sleeve second end to the peripheral surface of said conduit and projecting within said manhole well, and an annular gasket optionally disposed around said peripheral surface for compensating for difference in size between said conduit and said sleeve second end.

* * * * *

United States Patent [19]

Katz

[11] **Patent Number: 4,535,998**

[45] **Date of Patent: Aug. 20, 1985**

[54] **SEALING DEVICE FOR HYDRAULIC ENERGY DISSIPATOR OF THE TELESCOPIC TYPE**

[75] Inventor: **Maurice Katz, Paris, France**

[73] Assignee: **Creusot-Loire, Paris, France**

[21] Appl. No.: **579,938**

[22] Filed: **Feb. 14, 1984**

[30] **Foreign Application Priority Data**

Feb. 18, 1983 [FR] France 83 02645

[51] **Int. Cl.**³ **F16J 15/18**

[52] **U.S. Cl.** ..... **277/212 FB**

[58] **Field of Search** ..... 277/212 R, 212 FB

[56] **References Cited**

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Primary Examiner—Robert I. Smith

Attorney, Agent, or Firm—Pollock, Vande Sande & Priddy

[57] **ABSTRACT**

Sealing device for an hydraulic energy dissipator of the telescopic type, formed by a seal comprising a cylindrical ring which grips the rod of the piston and which is extended by a fluid-tight bellows so as to permit axial movement of the seal in its housing following small amplitude movements of the rod. The device is useful for railway suspension shock absorbers.

8 Claims, 3 Drawing Figures

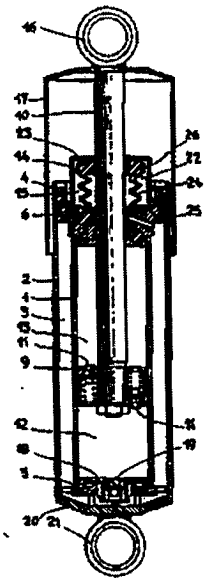


Fig1

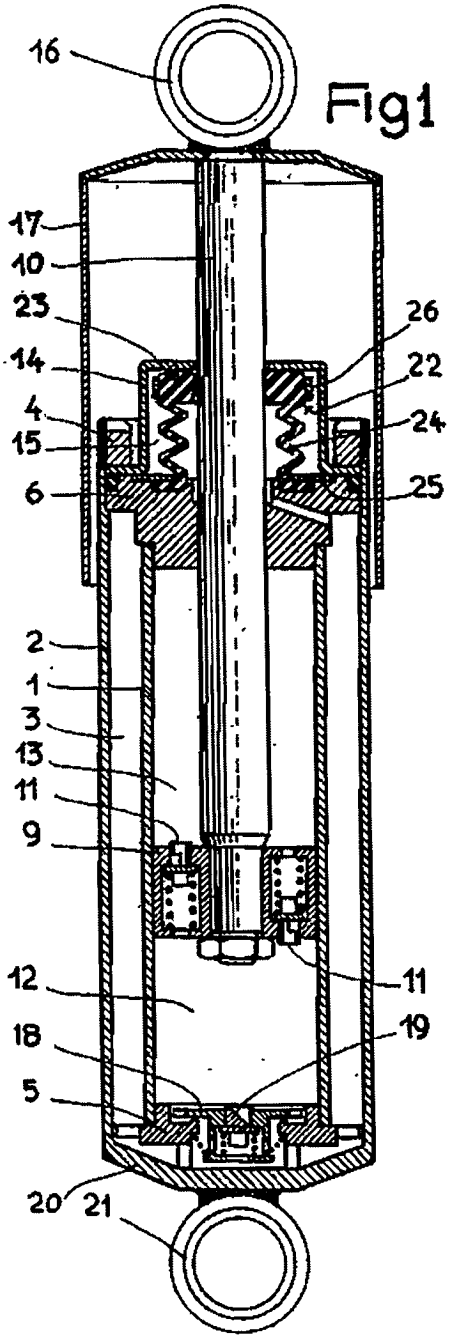


Fig 3

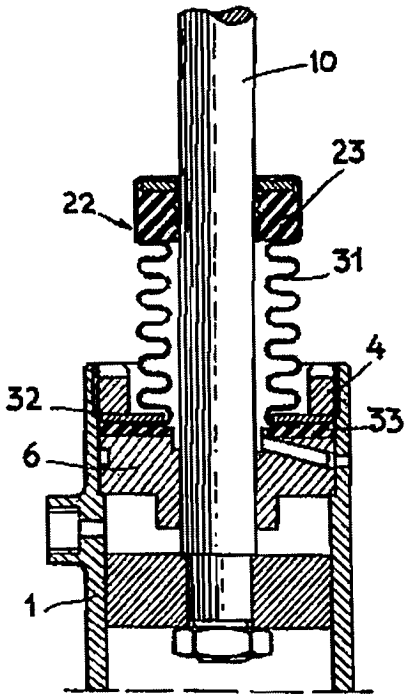
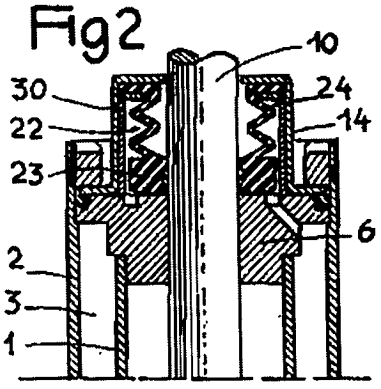


Fig2



SEALING DEVICE FOR HYDRAULIC ENERGY DISSIPATOR OF THE TELESCOPIC TYPE

FIELD OF THE INVENTION

The present invention relates to a sealing device for an hydraulic energy dissipator of the telescopic type, particularly for railway rolling stock suspensions.

BACKGROUND OF THE INVENTION

For such suspensions, it is known that damping devices which dissipate the mechanical energy as heat by shearing of oil driven by a piston through throttled passages, does not incorporate all the characteristics desired, and in particular lacks insufficient reliability.

In fact, the most common damping devices, of the telescopic piston type actuated by a rod in a cylinder filled with oil, do not generally permit suitable damping of oscillating movements of small amplitude or vibrations generated by the wheels, since they are easily initiated at rest and then necessitate long paths with oscillations of large amplitude to return to the normal operating stage. However the piston sucks in first, in each direction of movement, the air dissolved in the oil; on its return, this creates a vacuum causing the cavitation phenomenon manifested by particularly unpleasant hard and violent jerks.

To overcome these drawbacks, shock-absorbers are known in which a slight permanent overpressure of the liquid completely filling the working chambers is maintained, by means of a compensating chamber where the reserve liquid is itself kept under pressure by spring or pneumatic devices.

However, in the field of railway suspensions, it is known that the oscillations to be damped are in the majority of cases vibrations of small amplitude with, from time to time, one or several distinctly bigger oscillations.

This causes a sealing problem around the rod of the piston in its passage through the jacket of the apparatus. In fact, if seals are used with considerable friction on the rod, the small oscillating movements are transmitted through the seals to the whole of the body. It is possible to reduce the friction a little so as to permit between the rod and the seal small amplitude movements which are then damped by the working of the fluid in the chambers; however in this case the very numerous oscillating movements result in rapid wear of the seals, and consequently leakages of oil which, in their turn, will result in a reduction in the permanent pressure in the apparatus and the appearance of cavitation phenomena.

This drawback is particularly troublesome in the railway field, since the mileage travelled by a vehicle between two major maintenance operations is generally considerable, so that effective active life of the shock absorbers is often well below the time between two successive adjustments.

Sealing devices formed by a diaphragm seal which grips the piston rod are also known, but the elasticity and the motion of this type of seal are distinctly insufficient to avoid its slippage with respect to the piston rod, as well as premature wear.

SUMMARY OF THE INVENTION

The present invention is intended to overcome such drawbacks, and it applies therefore to an hydraulic dissipator of energy of a moving mass, of the telescopic type, comprising:

(1) a working cylinder filled with liquid and divided into two chambers by a piston provided with calibrated valves determining the hydraulic resistance, and of which the rod connected to the moving mass is guided through one of the ends of the cylinder,

(2) an auxiliary annular compensating chamber surrounding the working cylinder, communicating through a valve and a calibrated valve with the working chamber opposite the rod of the piston, and

(3) a sealing device for the exit of the piston rod, arranged in a housing extending the working cylinder on the rod side.

According to the invention, the sealing device is formed by a seal comprising a cylindrical ring which grips the rod of the piston and which is extended by a fluid-tight bellows, coaxial with said rod, permitting axial movement of the seal in its housing, following the low amplitude movements of said rod.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood by means of the following description referring to particular embodiments given by way of example and referring to the accompanying drawings in which

FIG. 1 is an axial section view of an hydraulic dissipator of energy provided with the sealing device according to the invention.

FIG. 2 is a partial axial section view of a second embodiment of the invention.

FIG. 3 is a partial axial view of a third embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring first to FIG. 1, the energy dissipator comprises a working cylinder 1, surrounded by coaxial tube 2, forming with it an annular chamber 3. The working cylinder 1 is closed by a lower end 5 and by an upper 6 end constituting the counter-piston. A piston 9, sliding inside the working cylinder 1 and fixed to a rod 10, comprises two inverted and calibrated valves 11. This piston 9 divides the working cylinder 1 into two chambers 12 and 13.

The rod 10 passes through the counter-piston 6 through an orifice which constitutes a simple guide, with very limited play, but without being fluid-tight. A plug 14, held on the counter-piston 6 by a nut 4 screwed into the upper part of the tube 2, forms with said counter-piston a housing 15 for the mounting of a sealing device applied to the piston rod. This rod 10 is provided, at its outer end, with a coupling 16 and a protecting box 17. The lower end of the working cylinder 1 comprises a valve 18 opening wide passages to the liquid from the annular chamber 3 through the working chamber 12 on the aspiration of piston 9 and through a valve 19 which inversely opens a restricted passage to the annular chamber 3.

Tube 2 is hermetically closed by cup 20 bearing the lower coupling 21.

In the housing 15 is mounted a fluid-tight seal formed by a cylindrical ring 23 which by friction adheres fairly firmly to the rod 10 and which is extended by a fluid-tight bellows 24, of the which last fold is fixed by a washer 25 on its seat provided in the counter-piston 6. The inside of the bellows 24 communicates freely through wide apertures with the annular chamber 3.

The upper surface of the cylindrical ring 23 is slightly bulged to avoid a suction effect between this ring and the plug 14. It is also possible to roughen this upper surface, again to avoid the suction effect.

On the other hand, on the side face of the cylindrical ring 23 is mounted a gripping ring 26 in order to prevent the swelling of the seal under the effect of temperature. This gripping ring can optionally be molded directly in the ring of the seal.

During the movements of the rod 10, the cylindrical ring 23 of the seal 22, which by friction adheres fairly firmly to the rod 10, first follows the latter without slippage by drawing the bellows 24 until it comes possibly to abut the bottom of the plug 14 in the case of an extension movement exceeding a certain amplitude. Only then, if the movement continues further, the ring 23 starts to slide on the rod 10. In the opposite direction, in the case of a compressive movement, the ring 23 of the seal is driven downwards by friction. The fluid-tight bellows 24 hence permits greater movement than with customary seals of the diaphragm type.

In the case of oscillations of small amplitudes, which represent by far the large majority of movements, the ring 23 of the seal 22 remains stuck to the rod 10, following its motion without sliding. Since the wear of the seal is caused solely by sliding, there will hence be no wear in this case. Thus, the seal will wear only upon movements of the greatest amplitudes, which are very infrequent, and there will therefore have an exceptionally long life. Another advantage of the dissipator according to the invention is the elimination of vibrations and tremors customarily transmitted to the suspended portion because of the friction of the seal during small oscillations. On oscillations of greater amplitude, the relative value of the frictional forces with respect to the hydraulic reaction, which moreover is gradually initiated, becomes negligible, whence great gentleness of operation in all cases.

In the embodiment of the dissipator according to FIG. 2, the ring 23 of the seal 22 is oriented downwards and the last fold of the bellows 24 is fixed in fluid-tight manner to the upper portion of the housing 15 on the plug 14 by a support washer 30. The active surface of the seal is hence oriented towards the inside and communicates through very wide passages with the annular chamber 3, of which the low pressure, whether of air or of liquid, is exerted outside the seal 22, and tends, consequently, to grip it against the rod 10, which can sometimes offer an advantage of still longer service, particularly in the case of relatively greater oscillations.

In FIG. 3, the fluid-tight seal 22 is composed also of a cylindrical ring 23 crimped at the upper portion of a metal bellows 31 of which the last fold is fixed to the counter-piston 6 by the nut 4 by means of a fluid-tight seal 32 and a washer 33.

To ensure in all cases the possibility of axial movement of the seal without sliding on the piston rod, it would be possible also to provide helicoidal-shaped bellows, reinforced or not with spring-forming metal wires, or again provided with end pieces of elastic tubing enabling the axial deformations.

I claim:

1. Sealing device for an hydraulic energy dissipator of the telescopic type, comprising

(a) a working cylinder filled with liquid and divided into two chambers by an axially moving piston provided with calibrated valves determining the hydraulic resistance, a piston rod of said piston being guided through a first end of said cylinder;

(b) an annular compensating chamber surrounding said working cylinder and communicating through a valve and a calibrated valve with said working chamber adjacent the end of said cylinder remote from said piston rod;

(c) a fluid-tight seal for the exit of said piston arranged in a housing extending said working cylinder on the rod side, said fluid-tight seal being formed from a cylindrical ring which grips said piston rod and which is extended by a fluid-tight bellows, coaxial with said rod, enabling axial movement of said seal in said housing.

2. Sealing device according to claim 1, wherein said cylindrical ring has a slightly convex upper surface.

3. Sealing device according to claim 1, wherein said cylindrical ring has an upper surface which comprises roughnesses in relief.

4. Sealing device according to claim 1, comprising a gripping ring mounted on a lateral surface of said cylindrical ring.

5. Sealing device according to claim 4, wherein said gripping ring is directly molded in said cylindrical ring.

6. Sealing device according to claim 1, wherein the last fold of the bellows is fixed in sealed manner to one or other of the end surfaces of the housing.

7. Sealing device according to claim 1, wherein the fluid-tight bellows is a metal bellows at the upper portion of which is crimped the cylindrical ring of the fluid-tight seal.

8. Sealing device according to claim 1, wherein the fluid-tight bellows is a bellows of helicoidal shape.

* * * * *

United States Patent [19]

Houseman et al.

[11] **Patent Number: 4,570,943**

[45] **Date of Patent: Feb. 18, 1986**

[54] **SEALING FLASHING FOR BUILDINGS WITH INTERLOCKING RING MEMBERS**

[75] Inventors: **David G. Houseman, Richmond; Gary J. Binding, Boronia, both of Australia**

[73] Assignee: **John Deks Australia Pty. Ltd, Bayswater, Australia**

[21] Appl. No.: **706,329**

[22] Filed: **Feb. 27, 1985**

[30] **Foreign Application Priority Data**

Feb. 29, 1984 [AU] Australia PG3848

[51] Int. Cl.[4] F16J 15/02; F16L 41/06; E04D 13/14

[52] U.S. Cl. ..... 277/12; 277/212 FB; 52/60; 285/43

[58] Field of Search ..... 277/1, 9, 12, 32, 212 FB; 52/60; 285/3, 4, 42–44

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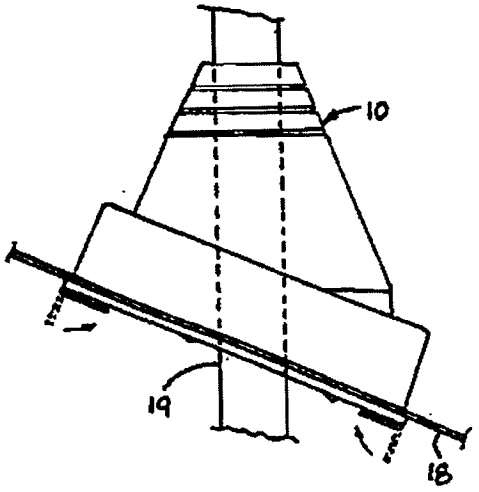
Primary Examiner—Robert S. Ward
Attorney, Agent, or Firm—Bucknam and Archer

[57] **ABSTRACT**

A flashing device for use on a building roof to seal about a pipe passing therethrough, comprising a sleeve of rubber or the like through which the pipe may pass with the upper end of the sleeve in sealing contact with the periphery of the pipe. A pair of rigid ring members are provided at the lower end of the sleeve, with a portion of the sleeve located between the ring members. The ring members being adapted to interlock together to compress the portion of the sleeve therebetween into sealing relation with a sheet material also located between the ring members.

13 Claims, 4 Drawing Figures



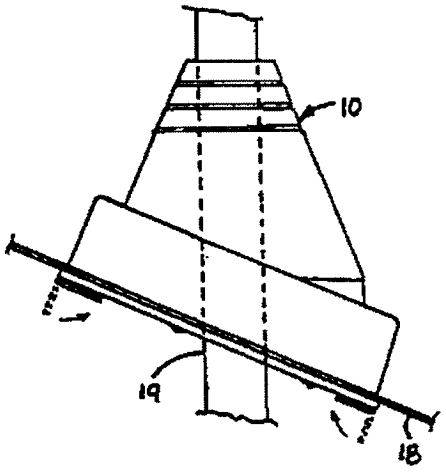


FIG. 1.

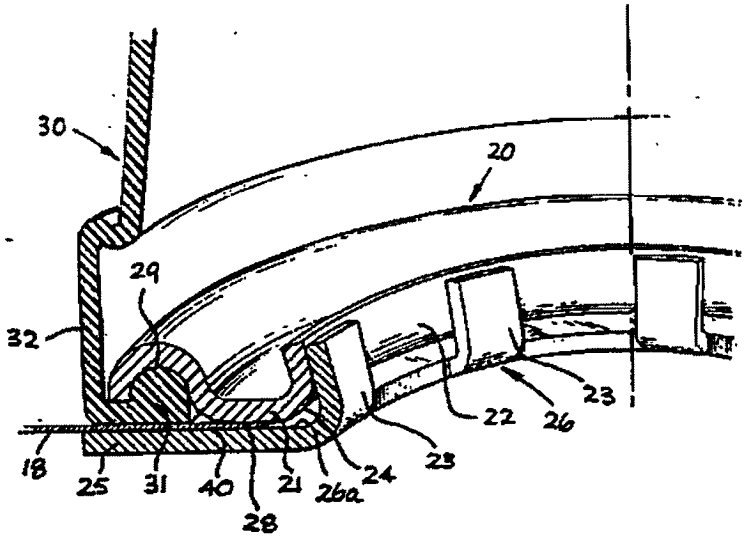
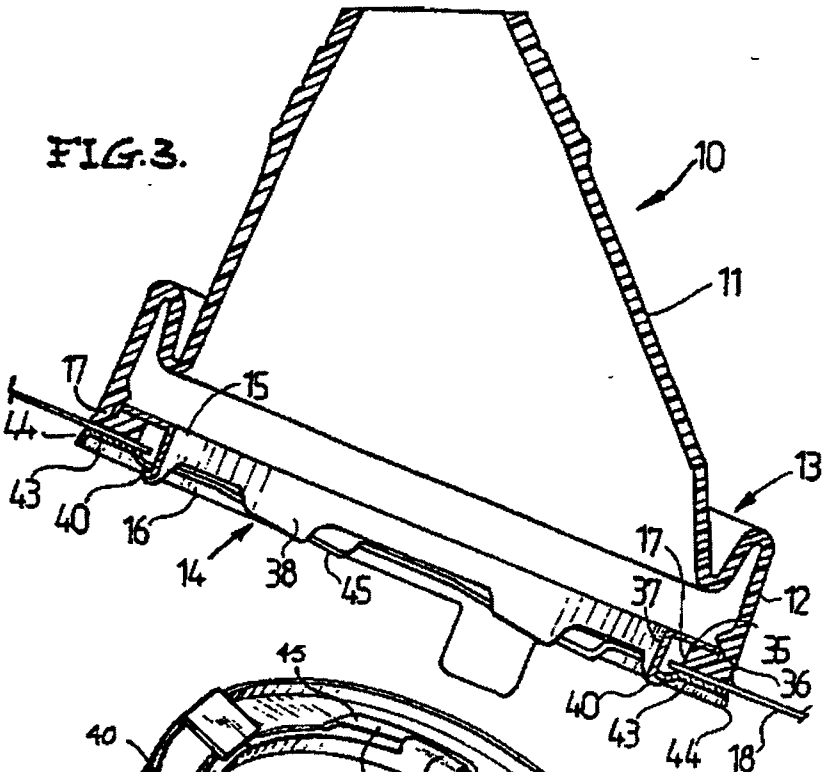


FIG. 4

FIG. 3.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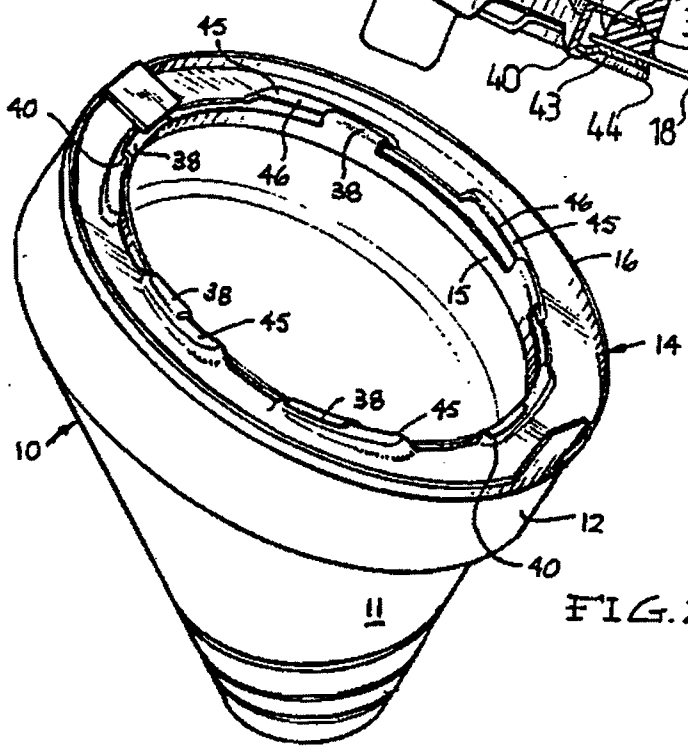
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FIG. 2.

SEALING FLASHING FOR BUILDINGS WITH INTERLOCKING RING MEMBERS

This invention relates to flashing devices as used to produce a weather-tight seal between a pipe conduit or other member which extends through the roof or wall of a building or like structure.

In the building industry there have been several constructions available for providing a seal around a pipe or other member extending through a roof or a building, but in the majority of cases these constructions required a considerable amount of fabrication on the site, and individual fitting to suit each installation. These prior constructions are satisfactory when constructed and fitted with the necessary degree of skill, but in recent times, with the general reduction in the availability of skilled labour, and the high costs of same, there is a need for a flashing construction which can be fitted by unskilled persons and which ensures an effective seal is established.

In U.S. Pat. No. 4,333,660 there is proposed a flashing or sealing device having a sleeve of resilient material with an integral outwardly extending flange at one end. An annular member of non-resilient flexible material is bonded to the flange to extend about the sleeve. In use a pipe or other conduit may extend through the sleeve, with the end of the sleeve remote from the flange stretched so as to scalably engage the external surface of the pipe. The flange and annular member bonded thereto are manually worked to closely fit the contour of a roof sheet through which the pipe extends, and is secured thereto by rivets or screws. The flange if resilient material is thus compressed between the roof sheet and the annular member to establish an effective seal with the roof sheet.

This flashing device is particularly suitable for use on metal roofs, where it is convenient to secure the flange by rivets or screws, but presents problems with other roof materials such as slates or tiles. Firstly it is difficult to make an accurately shaped hole for the passage of the pipe through such a roof. In order to deal with this problem the flange of a flashing device as above discussed would have to be large with resultant cost increases and transport and storage disadvantages. Secondly, as the flange is attached by screws and rivits there is the added problem of drilling tiles or slates and the high risk of damage or breakage of the tile or slate.

It is thus the principle object of the present invention to provide an improved flashing device whhich is simple to install, effective in operation, and may be used in sealing about pipes or conduits projecting through tile or slate roofs.

There is accordingly provided by the present invention a device for flashing about a pipe or conduit passing through a roof or wall;

a first member having an aperture therethrough for a pipe or conduit to pass through and a continuous first abutment surface extending about said aperture, a second member having an aperture therethrough for the pipe or conduit to pass through and a continuous second abutment surface extending about said aperture, said apertures and abutment surfaces being arranged so that when the first and second members are assembled to a pipe or conduit that extends through the respective apertures, the first and second abutment surface are in an opposing face to face substantially parallel relation substantially transverse to the axis of the pipe or conduit, means to secure the first and second members together in said assembled relation with a sheet of flexible material therebetween and through which the pipe or conduit also extends and a sleeve of flexible resilient material adapted at one end for attachment to the first member so that a pipe or conduit extending through the first and second members also extends through the sleeve, the other end of the sleeve being adapted to sealably engage the external surface of the pipe or conduit extending therethrough, said one end of the sleeve including a portion located in use to be compressed between the sheet and one of the members when the first and second members are secured together in said assembled relation.

Preferably the sleeve is provided with a bead portion that is received in a bead groove provided in the first member. Alternatively the perimetal edge of the first member is received in a recess or cavity formed in the internal surface of the bead.

Conveniently the first and second members are provided with inter-lockable elements to engage when the members are assembled, and to maintain the members in pressure engagement with the sheet. The lockable elements preferably engage in a snap action achieved by pressing the members together in a generally axial direction. Alternatively the inter-lockable elements may comprise a series of tongues on one member and slots in the other arranged so that the tongues extend through the slots, on assembly of the members, and the tongues are then deformed, twisted or otherwise manipulated to prevent their withdrawal from the slots.

Preferably the bead is located inwardly of the wall of the sleeve, at the one end thereof, and directed toward the other end of the sleeve. When the sleeve and first member are assembled the sleeve extends about the outer marginal portion of the first member, with the bead seated in a downward directed bead groove formed in the under surface of the first member. Preferably the one end of the sleeve is in a stretched condition to receive the first member and so the first member and the sleeve once assembled will normally remain so.

The bead and the bead groove are dimensions so that when the first and second members are assembled together, with the sheet material therebetween, the bead will be compressed between sheet material and the first member to form a moisture and weather seal. Preferably the first and second members engage opposite sides of the sheet material, and clamp same therebetween when the bead is in the compressed state.

In use the first and second members are assembled to the pipe or conduit on opposite sides of a sheet of flexible material, having an aperture therethrough for the passage of the pipe or conduit.

It is to be understood that the two members may be assembled to the sheet of flexible material prior to inserting the pipe or conduit through the respective apertures in the members, or in-situ on the pipe or conduit. Thus the two members and the sheet may be marketed as a combination either in an assembled or unassembled state.

The first and second members may be adapted to provide a closed cavity therebetween when assembled together, so the cavity may be filled with a flowable sealant compound. An aperture or port may be provided communicating with the cavity so that the sealant may be forced into the cavity direct from a sealant container or pressure sealant applicator.

The sleeve of flexible resilient material preferably tapers over at least part of its length. This form of sleeve may be used to fit a range of sizes of pipes or conduits by cutting the sleeve off at the appropriate location along the length of the tapered portion to provide an opening at the end of the sleeve that will sealably fit the particular size pipe or conduit. Suitable markings, such as annular grooves or ridges, may be provided on the surface of the tapered portion of the sleeve, to indicate the location at which to cut the sleeve for various sizes of pipe or conduit. The use of ridges has the additional advantage that it strengthens the edge of the sleeve against tearing then the sleeve is cut.

The provision of the resilient sleeve as above described enables the same first and second members to be used on a range of sizes of pipes or conduits.

The use of the sleeve of resilient material also has the advantage that misalignment of the pipe or conduit with the apertures in the first and second member may be accommodated by deflection of the sleeve. Due to the flexible resilient nature of the sleeve, any deflection thereof will not adversely affect the seal between the sleeve and the pipe or the first member.

The resilient sleeve may be arranged substantially co-axial with the apertures in the first and second member, or with its axis inclined thereto. As the surface of most roofs are inclined to the axis of any pipe or conduit extending therethrough at an angle that may range from 15° to 45° it may be preferable to have the axis of the sleeve inclined such as at 30°. The flexability of the sleeve will accommodate any difference between the inclination of the roof and the pipe or conduit.

The present invention will be more readily understood from the following description of one practical arrangement of the flashing device as illustrated in the accompanying drawings.

In the drawings;

FIG. 1 is an illustrative side view of the flashing device fitted to a pipe extending through a roof;

FIG. 2 is a perspective view from the under side of the flashing device;

FIG. 3 is a diametral section view of the flashing device; and

FIG. 4 is a perspective sectional view of part of an alternative construction of the attachment ring assembly for the flashing device.

Referring now to FIGS. 1, 2 and 3 of the drawings the flashing device comprises a sleeve member 10, made of a suitable flexible resilient material such as a natural or synthetic rubber, having a main tubular section 11 and an apron 12 interconnected by a re-entrant fold portion 13. The attachment ring assembly 14 comprises inner and outer ring members 15 and 16, carrying interlocking components which will be described in greater detail hereinafter. The inner ring member 15 is located substantially within the apron 12 of the sleeve member, with the sealing ring portion 17, integral with the apron, located between the peripheral portions of the inner and outer rings 15 and 16.

In use the sleeve member 10 is secured by the ring assembly 14 to a sheet 18 of flexible non-resilient material, such as light gauge metal, so that a pipe or like conduit 19 may pass through an opening in the sheet 18 and through the sleeve member 10, with the latter providing a seal between the pipe 19 and the sheet 18. The sheet of flexible non-resilient material 18 is fitted to a roof structure in the conventional manner which will be described in further detail hereinafter.

The inner ring member 15 has a generally annular portion 35, having a short axially extending lip 36 on the outer periphery and a longer axially extending flange or skirt 37 on the inner periphery. The lip 36 and skirt 37 provide stiffening to the annular portion 35, so that it will remain substantially flat under the clamping pressures generated by the assembly of the inner and outer ring members 15 and 16 as hereinafter described. The inner flange 37 has spaced around its lower edge a plurality of tongues 38, which terminate in outwardly directed lips 40. Each of the lips are located in a respective plane, with each plane inclined equally to the plane of the annular portion 35 of the inner ring member 15.

The outer ring member 16 is of generally annular shape having a flat portion 43 which, in use, is disposed parallel to the annular portion 35 of the inner ring member 15. The flat portion 43 of the outer ring member 16 has a continuous lip 44 about the outer peripheral edge thereof, and a plurality of ramp elements 45 spaced around the inner peripheral edge. The lip 44 and the ramps 45 provide stiffening to the flat portion 43 of the lower ring member 16 so that it will remain substantially flat when subject to clamping pressures.

The ramps 45 have lower inclined surfaces 46 each located in a respective plane inclined to the plane of the flat portion 43, substantially equal to the inclination of the lips 40 to the plane of the annular portion 35. The portions of the inner periphery of the outer ring member 16, intermediate the ramps 45, are cut out to permit the tongues 38 of the inner ring member 15 to pass through the central opening of the outer ring member 16. The surfaces 46 of the ramps 45 extend radially inward to an extent to underlie the lips 40 on the tongues 45. Thus, in use, the outer ring member 16 may be assembled to the inner ring member 15, whilst the latter is attached to the sleeve member 10, by locating the tongues 45 in general axial alignment with the spacers between the ramps 45, and subsequent rotating the outer ring member 16 relative to the inner ring member 15, to bring the lips 40 of the tongue 38 into engagement with the inclined surfaces 45 of the ramps 45. This rotation is in an anticlockwise direction as seen in FIG. 3 and will cause the lip 40 of the respective tongue 38 to ride up the inclined surface 46 of the cooperating ramp 45, so as to draw the annular portions 35 and 43 respectively towards each other in an axial direction as viewed in FIG. 3. The appropriate dimensioning of the inner and outer ring members 15 and 16, relative to the dimensions of the sealing ring portion 17 of the sleeve member 10 and the thickness of the sheet 18, enables the relative rotation between the inner and outer ring members to compress the sealing ring 17 into pressure sealing engagement with the surface of the sheet 18.

The angle of the inclined face 46 of the ramp 45 is chosen so that the relative rotation between the inner and outer ring members 15 and 16 can be effected manually to derive the necessary sealing pressure between the sealing ring and the plate 18. Conveniently the angle of the ramp is in the order of 5° to 10°, which will permit manual operation during assembly, and also preclude any likelihood of the ring members rotating in the reverse direction to release the compression pressure, under the forces which will exist in the clamping arrangement once it has been assembled.

The outer ring member 16 is provided with a pair of axially projecting lugs 50 to assist in rotation of the member 16 during assembly as previously described. After assembly the lugs 50 may be bent to overlay the

ramps 45 rearward of the lips 40 and so prevent rotation of in the direction to release the sealing pressure. One of the lugs is shown in this position in FIG. 3.

The flexible non-resilient sheet 18 to which the flashing device is fitted may conveniently be of lead, aluminum, copper or other material which will not be subject to corrosion under normal atmospheric conditions, and may include galvanised or other suitably coated steel sheet. The sheet is normally cut to a rectangular shape of sufficient dimensions so that when assembled to a tile or slate roof, the top edge portion of the sheet may be inserted between the overlapping edges of the tiles above the location of the flashing device, whilst the lower edge may be deformed to follow the contour of and overlap the junction of thr row of tiles below the flashing device. The manner in which the sheet 18 is fitted to a tile or slate roof is a conventional procedure, and the advantage of the present invention is the provision of the flashing device which provides the effective seal between the sheet 18 and the pipe 19 extending through the roof.

FIG. 4 of the drawings shows portion of an alternative construction of the ring assembly 14 whereby it is assembled in a snap action to compress portion of the sleeve member into a sealing engagement with the sheet.

Referring now to FIG. 4 the inner ring member 20 comprising a flat annular portion 21 with a skirt portion 22 projecting generally axially from the inner periphery of the annular portion. The skirt portion is inclined upwardly and outwardly with respect to the axis of the annular portion. The junction of the skirt portion 22 and flat annular portion 21 presents a downwardly directed convex or arcuate surface 24 that blends smoothly with each said portion.

The outer ring member 26 is in the form of flat annulus with a plurality of upwardly and outwardly directed fingers 23 about the inner peripheral edge thereof. The fingers 23 are dimensioned to enter the central opening defined by the skirt portion 22 of the inner ring member 20, and to engage the skirt portion 22 in a snap action to hold the inner and outer ring members in assembly. The convex surface 24 of the inner ring member assists in promoting the resilient deflection of the fingers 23 to establish the snap action engagement of the fingers with the skirt portion 22.

The downwardly directed annular bead grooves 29 provided in the first ring member 20, outwardly of the annular portion 21, is of generally semi-circular cross-section and located upwardly of the lower surface 28 of the annular portion 21. The sleeve member 30 is generally of the same construction as shown in FIG. 2 and has at the lower end a bead 31 which extends inwardly and upwardly with respect ot the apron portion 32 of the sleeve member. The bead 31 is continuous about the lower end of the sleeve member and is received in the bead groove 29 of the inner ring member. Preferably the diameter of the apron 32 at the lower end is selected so that it must be stretched to receive the inner ring member 20 so they will normally remain in assembly.

The bead 31 and bead groove 29 are dimensioned so that, when the inner ring member 20, with the sleeve member assembled thereto, is assembled to the sheet 18, and the outer ring member 26 is assembled to the inner ring member, the bead 31 will be compressed between the sheet and the inner ring member to form a seal therebetween. Preferably when so assembled the sheet 18 is also clamped between the annular portion 21 of the inner ring member and the flat annular portion 26a of the outer ring member.

As the principle use for the flashing device is sealing about pipes that project through the roof of a building, and as such roofs are usually inclined to the axis of the pipe, the axis of the apron 12,32 is inclined to the axis of the tubular portion 11 of the sleeve member 10,30.

The pitch or inclination of a building roof may vary with the design of the building and the roofing material used. Normally the angle of the roof is between 15° to 35° to the horizontal. Accordingly the angle between the surface of the roof and the axes of a vertical pipe passing therethrough is 75° to 55°.

Provided the diameter of the central opening in the inner and outer ring members is sufficient, relative to the diameter of the pipe passing therethrough, a range of roof inclinations can be accommodated by the same flashing device.

The sleeve member 10 is formed from a flexible resilient material, such as rubber or a thermoplastic material, selected so that it will retain its resilient properties in the environment to which it is intended to be subjected in use. As the major application for the flashing device will result in the sleeve member being positioned on vents or conduits extending the roof or external wall of a building, it will be exposed to a range of climatic conditions, including strong sunlight, a resilient material, particularly suitable for use in such conditions are ethylene propylene diene monomers and ethylene propylene terpolymer.

The fold portion 13 and apron 12 provide a substantial degree of flexibility between the attachment assembly 14 and the tubular member 10 to accommodate misalignment between the various components, and if required a greater degree of flexibility can be obtained by using a multiple fold or pleat construction.

As the flashing device is intended to cover a range of pipe or conduit sizes, the opening 9 at the upper end of the tubular section is of a size to receive in sealing engagement the smallest size conduit intended to be used. The upper end portion 8 of the tubular member is provided with concentric grooves 7 which correspond to the size of aperture required to accommodate three further sizes of conduits. A workman may enlarge the size of the opening 9 by cutting along either one of the grooves to suit the particular size conduit. Larger sizes of conduit may be accommodated by cutting around the periphery of the tubular portion 10 at appropriate locations.

The claims defining the invention are as follows:

We claim:

1. A device for flashing about a pipe or conduit passing through a roof or wall,

a first member having an aperture therethrough for a pipe or conduit to pass through and a continuous first abutment surface extending about said aperture, a second member having an aperture therethrough for the pipe or conduit to pass through and a continuous second abutment surface extending about said aperture, said apertures and abutment surfaces being arranged so that when the first and second members are assembled to a pipe or conduit that extends through the respective apertures, the first and second abutment surfaces are in an opposing face to face substantially parallel relation substantially transverse to the axis of the pipe or conduit, means to secure the first and second members together in said assembled relation with a sheet of

flexible material therebetween and through which the pipe or conduit also extends and a sleeve of flexible resilient material adapted at one end for attachment to the first member so that a pipe or conduit extending through the first and second members also extends through the sleeve, the other end of the sleeve being adapted to sealably engage the external surface of the pipe or conduit extending therethrough, said one end of the sleeve including a portion located in use to be compressed between the sheet and one of the members when the first and second members are secured together in said assembled relation.

2. A device as claimed in claim 1 wherein said one end of the sleeve is adapted to be attached to the first member so that in use said portion of the sleeve is located between the abutment surfaces of the first and second members.

3. A device as claimed in claim 2 wherein the portion of the sleeve is an annular bead seated in an annular bead groove formed in the first member substantially co-axially with the aperture in the first member.

4. A device as claimed in claim 2 wherein the perimetal edge of the first member is received in a recess in the internal surface of sleeve.

5. A device as claimed in claim 3 wherein the perimetal edge of the first member is received in a recess in the bead portion of the sleeve.

6. A device as claimed in claim 1, wherein the first and second member carry interlockable elements adpated to co-operate where the first and second members are assembled with said portion of the sleeve compressed between one of the members and sheet to maintain the members in assembly and said portion of the sleeve compressed.

7. A device as claimed in claim 6 wherein the interlockable elements co-operate in a snap-action to secure the first and second members in assembly.

8. A device as claimed in claim 6 wherein each of the members is of annular form with the inner periphery of each having a shirt extending generally in the axial direction, each of said skirts being inclined outwardly and adapted so that when the members are in the assembled position the two skirts interlock in a snap action to occupy a nesting relation.

9. A device as claimed in claim 8 wherein the skirt on one member is substantially continuous in the circumferential direction and the skirt on the other member is a series of circumferentially spaced segments.

10. A device as claimed in claim 1 wherein the first member has a continuous annular portion adapted for location within said one end of the sleeve with a sealing ring integral with the sleeve underlying the annular portion, and a continuous skirt at the inner periphery of the annular portion to in use project axially inward of the sleeve and incline radially outward with respect to the axis of the first member, and wherein the second member has an annular portion adapted in use to underlie the annular portion of the first member with the sealing ring therebetween, a plurality of fingers spaced along the inner periphery of the annular portion of the second member and integral therewith, said fingers being adapted to engage in a snap action the inner peripheral surface of the skirt of the first member when assembled thereto, and when so engaged to hold the sheet in sealing engagement against the sealing ring.

11. A device as claimed in claim 1 wherein the means to secure the first and second members together comprise a plurality of ramps formed on the first members spaced about the inner periphery thereof, and a plurality of complement tongues on the second member, said ramps and tongues being arranged to co-operatively engaged by initially inserting the tongues through the central aperture of the first member and thereafter effecting relative angular movement between the two members to move the tongues upwardly along the ramps.

12. A device as claimed in claim 11 wherein the second member is in use located substantially within said one end of the sleeve with said portion of sleeve underlying the second member.

13. A device as claimed in claim 10, wherein an outer peripheral portion of the first member is frictionally gripped by the sleeve to normally hold the sleeve and first member in assembly.

* * * * *

United States Patent [19]

Tupman

[11] **Patent Number: 4,574,548**

[45] **Date of Patent: Mar. 11, 1986**

[54] **COLUMN REGLET**

[75] Inventor: Thomas G. Tupman, Newport Beach, Calif.

[73] Assignee: Fry Reglet Corporation, Alhambra, Calif.

[21] Appl. No.: 580,380

[22] Filed: Feb. 15, 1984

[51] Int. Cl.[4] E04B 1/00; E04F 13/06

[52] U.S. Cl. 52/255; 52/262; 52/283; 52/371; 52/716

[58] Field of Search 52/220, 221, 371, 283, 52/288, 255, 219, 58, 716; 285/42, 192

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Primary Examiner—Alfred C. Perham
Attorney, Agent, or Firm—Fred Flam

[57] ABSTRACT

A two part molding structure provides a quirk or reveal about a cylindrical column, one part being a spacer ring of flexible material, and the other part being an extruded metal grounding member of simple cross sectional configuration whereby it can be preformed or bent in situ to surround the spacer ring and form therewith the channel or reveal. The grounding member either provides a channel upon which ceiling tile can rest, or an edge against which moldable material, such as plaster, can be applied.

8 Claims, 4 Drawing Figures

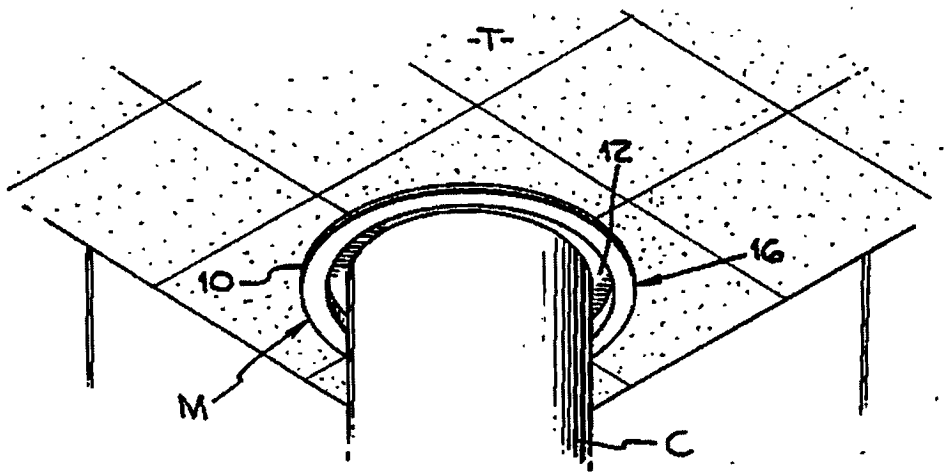


Fig. 1.

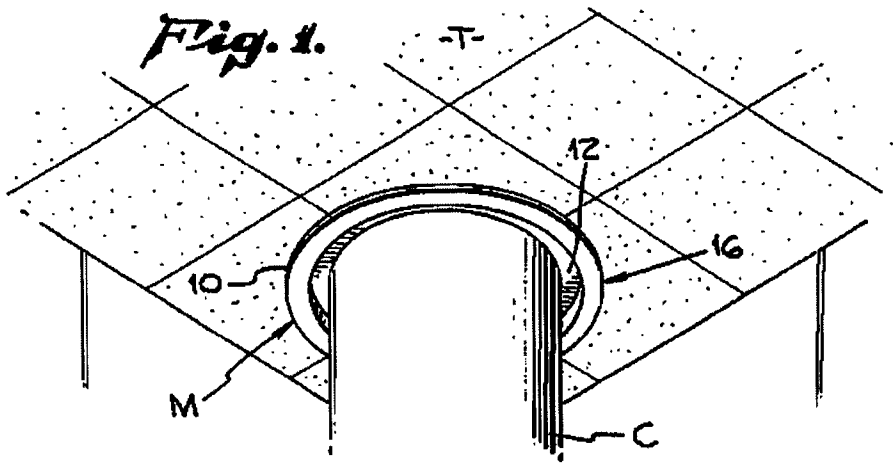


Fig. 2.

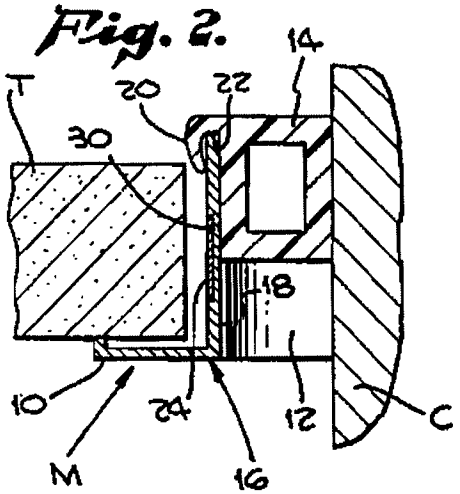


Fig. 4.

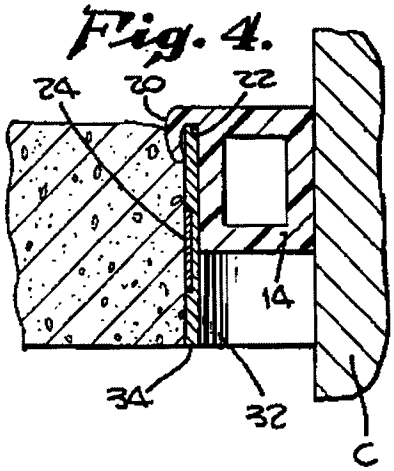
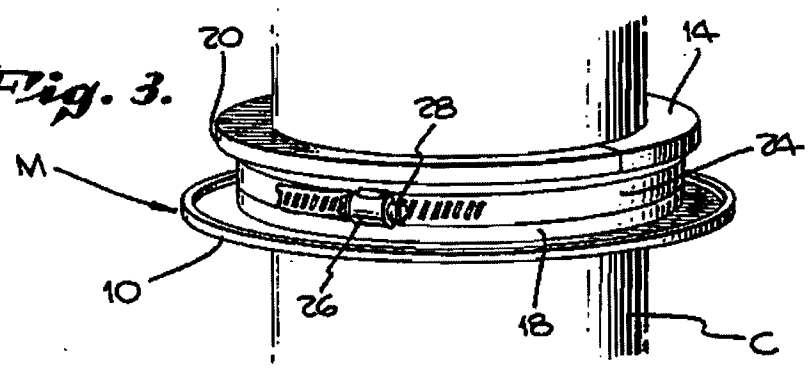


Fig. 3.



COLUMN REGLET

FIELD OF INVENTION

This invention relates to moldings for providing a neat junction between two architectural elements, and more particularly to a reveal moldings for use between cylindrical columns and ceiling plaster or tile.

BACKGROUND

Various metal molding strips that provide a reveal are shown and described, for example, in U.S. Pat. Nos. 3,606,714 and 3,486,283 to Robert W. Arnett, respectively entitled MOLDING STRIP FOR USE AS QUIRK OR REVEAL and SOFFIT MOLDING. Some of the shapes can be rolled into a curved configuration to conform to building structures having relative large radii of curvature. For example, the "F" molding shown in the U.S. Pat. No. 3,606,714 can successfully be rolled to curve about an axis parallel the the stem of the "F" providing the radius of curvature is fairly large. The bars of the "F" are short enough to accommodate some elongation.

To provide a downwardly opening reveal about a cylindrical column for cooperation with ceiling tile, a wide "W" section molding seems appropriate, one of the flanges of the "W" section lying against the column and attached thereto and the other of the flanges radiating outwardly from the column for supporting ceiling tile, the intermediate offset of the "W" providing the required reveal. Roll forming a section such as this with a small radius of curvature has not been successfully achieved. Even a simpler "Z" shaped section to provide a plaster ground cannot economically be curved to fit a column.

For lack of an adequate molding, there exist otherwise well designed buildings with crudely hand cut tiles fitted about a cylindrical column or with plaster badly joined thereto. It has been proposed to cut V-shaped notches in the sections of the metal preparatory to bending. This, however, is tedious, expensive, and at best a compromise. There has accordingly been a demand by architects and builders for an economical molding for use about cylindrical columns for neat juncture of ceiling tile or plaster.

SUMMARY OF INVENTION

The primary object of the present invention is to provide a simple and inexpensive reveal molding for use about a column of small radius of curvature. In order to achieve this objective, I provide a composite or two part molding. One part comprises a plastic spacer easily wrapped about the column; the other part comprises an extruded strip of simple configuration easily flexed or roll formed to assume the high degree of curvature corresponding to that of the column. The parts interfit. Together they are secured to the column by a band clamp. The requisite configuration for reveal is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description of the invention will be made with reference to the accompanying drawings wherein like numerals designate corresponding parts in the several figures. These drawings are to scale.

FIG. 1 is a perspective view from below of an architecturally completed column and ceiling utilizing a molding incorporating the present invention.

FIG. 2 is an enlarged transverse sectional view of the molding taking along a plane corresponding to the line 2—2 of FIG. 1.

FIG. 3 is a perspective view of the molding structure in the process of being clamped to the column prior to installation of ceiling tile.

FIG. 4 is a sectional view similar to FIG. 2, showing another form of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following detailed description is of the best presently contemplated mode of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for purposes of illustrating the general principles of the invention, the scope of the invention being defined by the appended claims.

Structural and operational characteristics attributed to forms of the invention first described shall also be attributed to forms later described, unless such characteristics are obviously inapplicable or unless specific exceptions are made.

In FIG. 1 there is illustrated a cylindrical column C that may be structural or decorative and that may be made of any material, such as concrete, steel or laminated wood. The column C projects upwardly beyond a ceiling structure. In the present example, the ceiling structure comprises acoustic tile T. The juncture between the tile T and the column C is neatly defined by a molding M that includes a flange 10 extending radially outwardly of a downwardly opening channel 12.

The crudely cut edges of the tile T are concealed by the flange 10 whereby a neat juncture can expeditiously be provided by ceiling tile workers. The bottom or upper end of the channel 12 is part of the molding M itself. This channel closely encircles the column C.

The molding, as more clearly shown in FIG. 2 comprises two main parts, a spacer ring 14 and a grounding member 16. The spacer ring 14 encircles the column C and partially defines the channel or reveal 12. The grounding member 16 is a strip of "L" shaped cross-sectional configuration, with its base or stem 18 surrounding and engaging the outer surface of the spacer ring 14. The stem 18 of the grounding member 16 projects below the spacer ring to define the outer wall of the channel or reveal 12. From the lower end of the stem 18, the flange 10 projects radially outwardly to form a ledge upon which the edges of the tiles T rest.

The grounding member is made of resilient extruded aluminum or other suitable material. Its simple "L" configuration allows it easily to be roll formed to conform to the radius of the column C plus the thickness of the spacer ring 14. The spacer ring 14 is made as an extrusion of flexible plastic material such as a suitable vinyl composition. Preferably, the ring has a hollow core to add flexibility and to conserve material. It readily bends to conform to the column C. The spacer ring 14 and the grounding member 16 interfit to determine a desired assembled relationship. For this purpose, the spacer ring 14 has a lip 20 that forms a shallow groove 22 for reception of the upper edge of the grounding member 16.

Prior to installation, the ends of the ring 14 and the ends of the grounding member 16 are not joined together, but are left free. At the site of installation, the

two parts are, or have been, interfitted. The adjacent ends are axially separated to cause them to assume the configuration of a one turn helix, thus to provide an access opening whereby the parts can be slipped over the column C. Thereafter, the ends are repositioned and the normal circular configuration reassumed.

After the assembled spacer ring 14 and grounding member 16 are positioned at the proper ceiling height, they are clamped together and to the column C by a clamping band 24 as shown in FIG. 3. The band 24 has fittings of known construction for mounting draw screw members 26 and 28. The band 24 is accurately positioned by being seated in a shallow channel 30 formed in the stem 18 of the grounding member 16.

The two part construction is exceedingly simple, and easily installed to provide a neat finished appearance between the ceiling tile and the column.

DESCRIPTION OF SECOND EMBODIMENT

In the form of the invention shown in FIG. 4, a grounding member 32 is provided that is similar to the grounding member 16 of the previous form. In the present example, however, the grounding member simply provides an edge 34 instead of a flange. To this edge, plaster or moldable material is applied, the edge serving as a ready means for trimming the splashings to provide a neat well defined terminus for the ceiling material.

In the present example, the grounding member 32, being of straight section, is easily flexed at the building site to conform to the column curvature. Installation is easily accomplished by assembling the spacer ring 14 and the grounding member 32 while in their straight configuration, and then flexing both into position for cooperation with the clamping band.

Intending to claim all novel, useful and unobvious features and combinations of features shown or described, I claim:

1. In a building structure having a vertically extending, substantially cylindrical column, the combination therewith of:
   a. a spacer ring made of flexible material adapted to surround said cylindrical column;
   b. a gounding member surrounding the spacer ring, and made of material bendable to a curved configuration to conform to the radius of the cylindrical column and said spacer ring, said grounding member having a simple cross-sectional configuration to facilitate bending thereof;
   c. clamp means for holding the grounding member and the spacer ring to the cylindrical column;
   d. said grounding member having a distal part projecting axially beyond said spacer ring and along said column to form therewith an annular channel or reveal;
   e. said grounding member having a flange projecting radially outwardly in a substantially horizontal plane to provide a support over which finish tile and the like material may be placed with said flange concealing, from below, the edges of said tile and the like material; and
   f. finish material placed over said flange support.

2. The combination as set forth in claim 1 in which said grounding ring is performed to a curved configuration.

3. The combination as set forth claim 1 in which said spacer ring has a lip providing a pocket interfitting the proximal end of said grounding member to hold the spacer ring and said grounding member in assembled relationship and to determine a relative axial position therebetween.

4. In a building structure having a vertically extending, substantially cylindrical column, the combination therewith of:
   a. a spacer ring made of flexible material surrounding said column;
   b. a grounding member surrounding the spacer ring, and made of resilient material bendable to a curved configuration to conform to the radius of the column and said spacer ring, said grounding member having a simple cross sectional configuration to facilitate bending thereof;
   c. a clamping band holding the grounding member and the spacer ring to the column;
   d. said grounding member having a distal part projecting axially beyond said spacer ring to form therewith an annular channel or reveal, said grounding member having a radial flange projecting from said distal part; and
   e. ceiling tile cut to rest on said flange.

5. In a building structure having a vertically extending, substantially cylindrical column, the combination therewith of:
   a. a spacer ring made of flexible material surrounding said column;
   b. a grounding member surrounding the spacer ring, and made of resilient material bendable to a curved configuration to conform to the radius of the column and said spacer ring, said grounding member having a simple cross sectional configuration to facilitate bending thereof;
   c. a clamping band holding the grounding member and the spacer ring to the column;
   d. said grounding member having a distal part projecting axially beyond said spacer ring to form therewith an annular channel or reveal, said distal part terminating in an edge; and
   e. moldable finish material surrounding said grounding member with the said moldable finish material flush with and abutting said edge.

6. In a building structure having a vertically extending, substantially cylindrical column, the combination therewith of:
   a. a spacer ring made of flexible material adapted to surround said cylindrical column;
   b. a grounding member surrounding the spacer ring, and made of material bendable to a curved configuration to conform to the radius of the cylindrical column and said spacer ring, said grounding member having a configuration substantially as a nominally flat strip to facilitate its being flexed at a building site to conform to the curved configuration of said cylindrical column;
   c. clamp means for holding the grounding member and the spacer ring to the cylindrical column;
   d. said grounding member having a distal part projecting axially beyond said spacer ring and along said column to form therewith an annular channel or reveal;
   e. said distal part terminating in an edge to which moldable finish material can be applied with the edge serving to trim excess finish material; and
   f. finish material applied to the edge of said distal part.

7. The combination as set forth in claim 6 in which said spacer ring has a lip providing a pocket interfitting the proximal end of said grounding member to hold said grounding member and said spacer ring in assembled

relationship and to determine a relative axial position therebetween.

8. In a building structure having a vertically extending, substantially cylindrical column, the combination therewith of:

a. a spacer ring made of flexible material adapted to surround said cylindrical column;

b. a grounding member surrounding the spacer ring, and made of material bendable to a curved configuration to conform to the radius of the cylindrical column and said spacer ring, said grounding member having a simple cross-sectional configuration to facilitate bending thereof;

c. clamp means for holding the grounding member and the spacer ring to the cylindrical column;

d. said grounding member having a distal part projecting axially beyond said spacer ring and along said column to form therewith an annular channel or reveal;

e. said grounding member having a flange projecting radially outwardly in a substantially horizontal plane to provide a support over which finish tile and like material may be placed with said flange concealing, from below, the edges of said tile and like material; and

f. finish material placed over said flange support.

* * * * *

United States Patent [19]

Houseman

[11] **Patent Number: 4,664,390**

[45] **Date of Patent: May 12, 1987**

[54] **WEATHER SEAL DEVICE FOR CONDUIT EXTENDING THROUGH RIDGED SURFACE**

[75] Inventor: **David G. Houseman, Richmond, Australia**

[73] Assignee: **John Deks Australia Pty. Ltd., Bayswater, Australia**

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[52] U.S. Cl. ..... 277/12; 277/212 FB; 52/58; 285/42

[58] Field of Search ..... 277/9, 12, 32, 213, 277/169, 212 FB; 285/3, 4, 42-44; 52/58-60, 199

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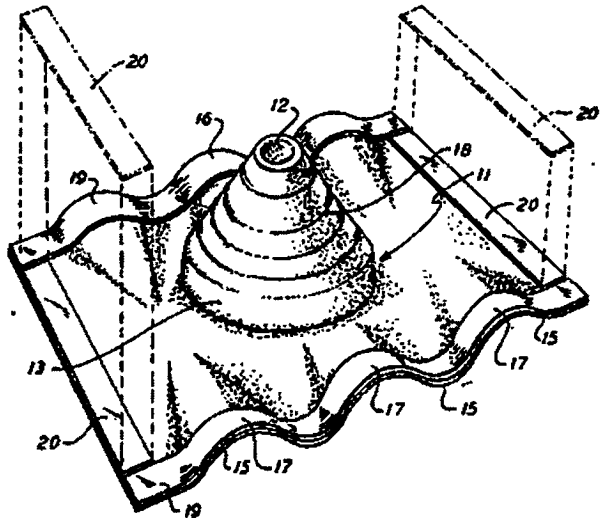
Primary Examiner—Robert S. Ward

Attorney, Agent, or Firm—Laughlin, Markesohn Lagani & Pegg

[57] **ABSTRACT**

A weather seal device for providing a seal between a surface having longitudinal ridges and/or valleys and an elongate conduit extending therethrough, the device having an apertured base of resilient deformable material and a sleeve of resilient material integral with the base and projecting from one side. The base in use is superimposed on the surface and the elongated conduit extends through the aperture and through the sleeve. The base has a marginal edge portion to be positioned in use so that it extends in a direction inclined in the direction of the longitudinal ridges and/or valleys. The marginal edge portion is contoured along its length in a direction normal to the plane of the base, so that in a free state the length of the marginal edge portion measured along the contours is greater than the linear length.

15 Claims, 4 Drawing Figures



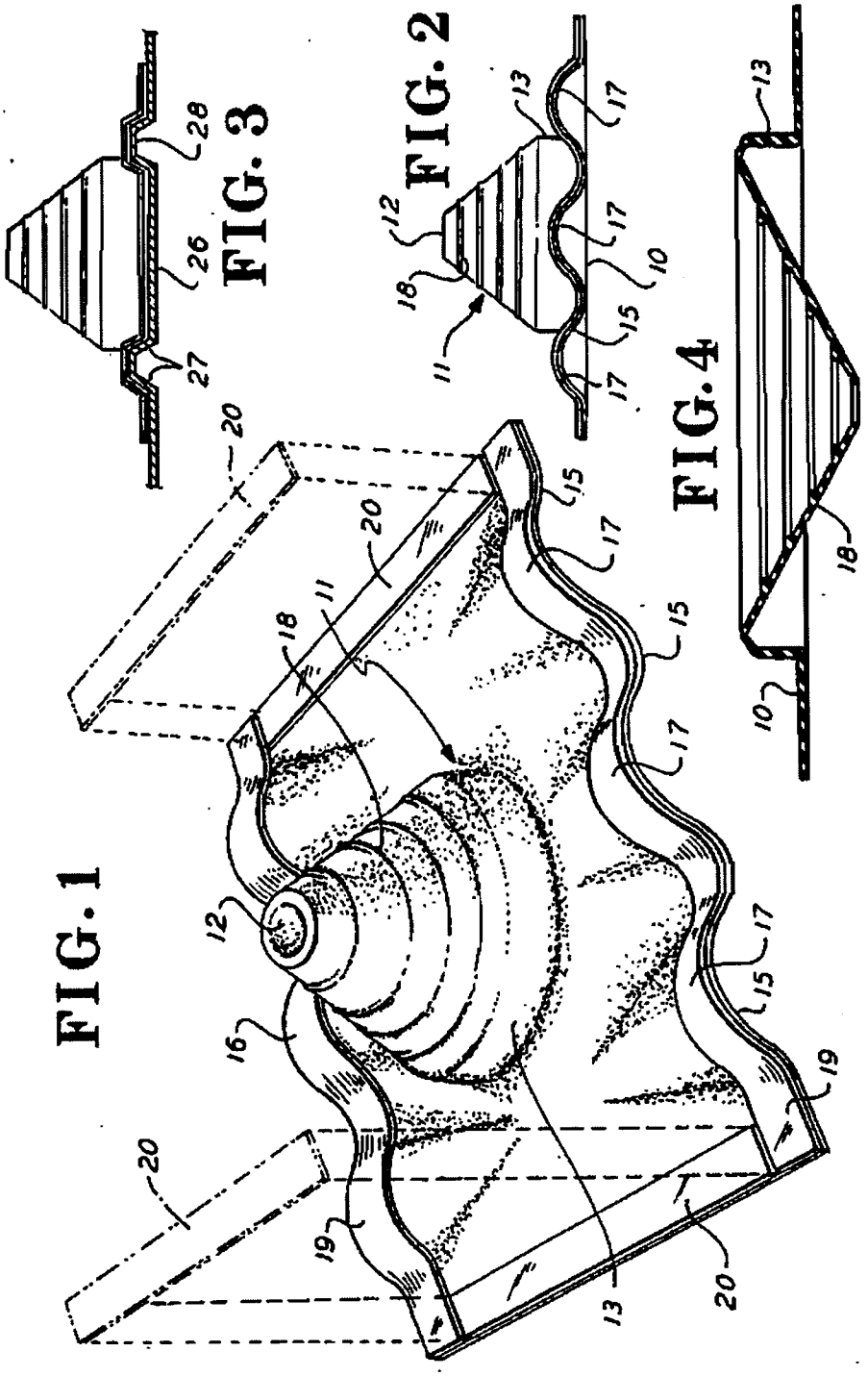


FIG. 1
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WEATHER SEAL DEVICE FOR CONDUIT EXTENDING THROUGH RIDGED SURFACE

This invention relates to an improved seal device for providing a weather seal between an elongate member and a non-planar surface such as a roof or wall of a building or like structure.

BACKGROUND OF THE PRIOR ART

There are currently in use in Australia seal devices for this purpose comprising an apertured base member including a non-metallic apertured flange element of resilient material bonded in face-to-face relation to a continuous peripheral metallic flange, and a sleeve member of resilient material integral with the base member and which extends outwardly therefrom to receive the elongate member. The base member is in use secured to the non-planar surface, and is of a non-resilient manually deformable nature so that, in use, it may be deformed to conform to the contour of the non-planar surface and will substantially retain such deformed contour. The sleeve member has an end remote from the base member which is adapted to receive said elongate member in sealing engagement therewith when the seal device is in use. The sleeve member, between the said remote end thereof and the base member, is sufficiently flexible to accommodate in use misalignment between the base member and the remote end of the sleeve, that may arise during installation or during the service life of the seal device.

The seal device above referred to is described in more detail in U.S. Pat. No. 4,333,660 in the name of G. M. Cupit. This seal device is very effective when used for pipes or ducts of a size up to about 400 mm diameter or similarly sized rectangular. However in many applications, as encountered in industrial and commercial building, it is required to seal about large pipes or ducts, as used in ventilation and air conditioning systems, frequently of diameters of 600 mm and above.

When sealing around ducts of this order of size the number of ridges or valleys over which the base member of the seal device may extend is increased. This requires a corresponding increase in the length of material required in the base member edge area to accommodate the degree of contouring necessary for the base member to follow the ridges and valleys. Also the increased degree of contouring in the edge area of the base member produces an increased degree of distortion over the general area of the base flange, and this distortion may extend into the sleeve member itself.

If we consider the prior proposed seal device in a large size, and having a flat rectangular shaped base flange, with a continuous one piece deformable metal strip along the complete marginal edge, the following problems arise in use. When the two opposite edge portions of the base member, which extend transversely across the ribs and valleys of the sheet, are contoured to follow the profile of a roof sheet, the length of these two edge portions is shortened. Consequently the two longitudinally disposed edge portions of the base member are required to move towards one another, as they are rigid at their ends with the ends of the two transverse contoured edge portions. However as the centrally located sleeve member is relatively stiff compared to the flange, the majority of the inward movement is accommodated in distortion of the area of the base flange on either side of the sleeve member.

This can result in folds and pockets in the base flange extending between the ridges of the roof sheet, which functions as a dam to water flow. This damming of the water flow is not acceptable as it aggravates leakage problems, especially in so-called flat and low pitched roofs.

If the sleeve member is made more resilient, so that it may deflect to absorb part of an inward movement of the longitudinal edges, this reduces the maximum size the of duct that may pass through the sleeve member.

Further with the one piece metal strip about the edge portion of the base member, the position of the two side portions of the strip is determined solely by the degree of shortening of the transverse portions of the strip subjected to the contouring. This can result in the side portions being positioned where it is inconvenient or difficult to secure them in sealed contact with the roof sheet. Such a location may be on a fold in the roof sheet, or on a vertical or near vertical side of a ridge or valley.

Similar problems exist if the seal device of the prior art has a circular flange with a continuous metal strip secured thereto along the perimetal marginal portion. The greater the amount of contouring of the strip required to accommodate the ridges and valleys of the roof sheet, the greater is the reduction of the diameter of strip and the degree of folding required of the flange inwardly of the perimetal strip.

SUMMARY OF THE INVENTION

It is therefore the object of the present invention to provide an improvement in the weather seal device which is effective in operation, convenient to install on a wide range of surface contours and elongate member cross-sections, and reduces or overcomes the problems above discussed.

With this object in view there is provided a weather seal device including a marginal edge portion comprising a deformable non-resilient flange element, and a resilient flange element attached thereto, each contoured so that the length of said edge portion measured along the contour is greater than the linear length thereof. These measurements are made when the edge portion is in the free as produced state and supported on a substantially flat surface.

Preferably the base member is moulded to the required contour during curing of the resilient material. The contouring may extend inwardly from the marginal portion and progressively decrease in height to blend smoothly into the base member at locations inwardly from the edge thereof.

It is to be understood that the contour provided in the marginal portion of the base member is not intended to correspond closely to the contour of the ridges and valleys on the surface to which the seal device is to be fitted. The contouring of the marginal portion provides additional material that may be reshaped to complement the configuration of the surface, without excessive distortion of the portion of the base member located between the marginal portion and the sleeve member and/or the sleeve member itself.

The reduction or elimination of distortion of the base member and sleeve, resulting from the additional length available in the marginal portion for conforming the base member with the surface to which the seal device is to be fitted, is important to ensure that water flow freely around the sleeve member and is not trapped in or behind folds or pockets formed in the base member. Also distortion of the sleeve member, which may re-

duce the effective diameter thereof and so reduce the maximum size elongate member that may be passed therethrough, can be reduced or eliminated.

Conveniently a strip of non-resilient manually deformable material is secured to the marginal edge portion of the base member along substantially the length thereof and follows the contour thereof. The strip and the marginal edge portion of the base member secured thereto may thus be non-resiliently deformed to complement the contour of the surface to which it is to be fitted. Also when in use the marginal edge portion may be pressed between the strip and the surface to provide a weathertight seal therebetween.

Preferably the contouring of the strip and the marginal portion of the resilient base member is in the form of a series of corrugations generally transverse to the direction of the length of the strip. The corrugations may be of an arcuate form or channel form or any other convenient contour.

The non-resilient deformable strip may conveniently be made of any appropirate material such as one of the soft matals particularly aluminium or aluminium alloy. Also preformed holes may be provided in the strip to provide a guide for drilling holes through the base member and through the sheet of material to which the sealing device is fitted during assembly. Suitable fastenings may be subsequently inserted through the holes.

In a preferred form the base member is of a generally rectangular outline with the sleeve projecting generally centrally therefrom. The strips of non-resilient deformable material are placed along two opposite parallel edges of the rectangular base member. Further strips of non-resilient deformable material may be provided along the other two edges of the flange, these strips not being rigidly connected to the strips to which the contours are applied.

In one preferred form the uncontoured strips are produced as a separate item to be assembled to the base member during installation, this construction permits the operator to select the most desirable location to place the strips in each particular installation, having regard to the longitudinal ridges and valleys on the sheet to which the seal device is being fitted. In this latter form the strips may be provided with a suitable contact adhesive on one surface, so that they may be bonded to the resilient flange by the operator at the selected location. Again the strips may be provided with preformed holes to receive fastening devices during installation.

The concept of having strips bonded to the transverse edge of the base member, so as to in installation lie across the valleys and ridges, and to have non-detached strips for fit to the longitudinal edges of the base member to extend in the direction of the valleys and ridges during installation, has advantages irrespective of whether the strips bonded to the flange are contoured or straight.

Accordingly, in one modified form of the invention the seal device has a base member comprising a flange of resilient flexible material to which the sleeve member is integrally formed, and has two strips of non-resilient deformable material extending along two opposite edges of the flange and bonded thereto in face-to-face relation, and two unattached strips of non-resilient deformable material are provided which may, during installation be fitted to the flange along the other two opposite edges.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a seal device in accordance with the invention.

FIG. 2 is a side view of the seal device shown in FIG. 1 fitted to a surface shown in cross section having longitudinal ridges.

FIG. 3 is a side view of the seal device shown in FIG. 1 fitted to a surface shown in cross section having longitudinal ridges of a second configuration.

FIG. 4 is a transverse sectional view of a method of molding the seal device shown in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

The seal device comprises a flange 10 of resilient readily deformable material, such as natural or synthetic rubber, having an integral sleeve 11 extending from the upper face of the flange. The sleeve 11 has a tapered portion 18 tapering toward the upper free end 12, and at the lower end has a generally cylindrical portion 13 that connects the tapered portion 18 to the flange 10. The wall of the cylindrical portion 13 is preferably somewhat thicker than the adjacent portion of the flange 10 and tapered portion 18 to provide greater resistance to distortion in use. The junction areas between the cylindrical portion 13 and the flange 10 and tapered portion 18 are sufficiently flexible to accommodate misalignment of the cylindrical portion relative to the other parts of the seal device, as may be necessary to normal use.

Spaced along the tapered portion 18 are a plurality of external ridges 14 denoting where the sleeve may be cut off to suit elongate members of different diameters. The ridges also provide a reinforcement about the edge of the open end of the sleeve so formed.

The flange 10 is of generally rectangular shape with the sleeve 11 disposed generally central thereof. In use the two opposite edges 15 and 16 of the flange are intended to be disposed across the direction of ridges and or valleys in the surface to which the seal device is to be fitted. Along each of the edges 15 and 16 the flange is provided with a number of contoured portions 17 which are displaced from the normal flat plane of the flange. In the example shown these contoured portions are generally arcuate, but may be of other shapes. The contoured portions 17 are of a maximum height at the edge of the flange and over the inner portion decrease in height to blend smoothly into the flat portion of the flange inwardly from the edge.

Along each edge 15 and 16 of the flange 10 there is provided a strip 19 of non-resilient deformable material such as aluminium or the like. Each strips are contoured to the same shape as the contoured edge portion of the flange, and is bonded or otherwise secured thereto in face to face relation. Conveniently the strips 15 and 16 may be bonded to the flanges during curing of the flange in a heated mould. Separate strips 20 may be provided to extend along the other edges of the flange 10. The strips 20 are independent of the strips 15 and 16 and are preferably spaced a short distance therefrom at the ends. This provides more freedom of movement of the flange material to avoid excessive folding in the area adjacent the sleeve. Also as previously stated it enables the operator some discretion in selecting where the side edges of the flange is to be fastened to the roof sheet.

It is preferable for the strips 20 to be free and not affixed to the flange 10 prior to installation. The side

edges of the flange tend to take up a slightly outwardly bowed shape during installation. This would be prevented if the strips were secured to the edge portion, and result in further folding or buckling of the flange inward of the edge. Also a more pleasing appearance is obtained by fitting the free strip in situ during installation so the strip is straight, parallel to the ridges of the roof sheet, and excess flange material outside of the strip may be cut off.

In one form the strips 20 may be coated on one face with a contact adhesive so that they may be applied to the flange at the appropriate location during installation of the seal device.

The preceding description has been specifically directed to providing a weather seal about an elongate member extending in sealing about a member or structure mounted on a roof or wall of a building, or in like situation. Examples of such structures are sky-lights, ventilators, and walls or parapet that adjoin a roof. As such structures usually have a flat surface there remains the problem that the length of the structure to be sealed against is less than that of the non-planar roof or wall. Accordingly, sealing devices for use in these areas also require one edge portion of the resilient sealing material to be moulded to a contour so the length measured along the contour is greater than the linear length of the edge portion. Preferably, as previously described, a strip of non-resilient deformable material, such as a metal strip, is bonded or otherwise secured to the contoured portion and has the same contour. When it is required to seal between a non-planar surface, such as a roof or wall and a flat surface which intersects same, the seal device may be a strip of resilient material contoured as above discussed along at least part of the length of one edge with the opposite edge flat. A metal strip may be provided along the flat edge also.

FIG. 3 of the drawings weather seal device described with reference to FIGS. 1 and 2 fitted to a roof sheet 25. The sheet 25 has longitudinal ridges 26 having flat inclined sides 27 and a flat top 28. The curved or arcuate contoured edge of the flange 10 in FIG. 1 has been re-shaped to conform to the profile of the sheet 25, and this has been achieved without a substantial change in the overall length of the edge portion of the flange.

The extent of the contouring of the edge portion is generally of the order that will reduce the length of the edge by 7 to 12% of the flat length. That is, after contouring the overall length is 93 to 88% of the flat length. In the roofing industry this is generally referred to as 93 to 88% yield. In different countries or locations the profile of normally used roof sheets may vary substantially, and thus the degree of contouring or percentage yield may vary substantially from the above quoted figures. In Australia there is one particular roof sheet which has approximately 25% yield. However, it has been found that one particular contour of the edge portion of the flange will accommodate a range of roof sheets of different yields. One particular contour does cover effectively the above stated range of 93 to 88% yield.

The weather seal device as described, with reference to FIGS. 1 and 2, may be produced as a moulding of rubber or like resilient material. In order to simplify the die for moulding such an article, part of the sleeve member may be formed as a re-enterant section that extends back through the aperture in the base member.

The mode of moulding the seal device is illustrated in the transverse sectional view. FIG. 4, wherein the tapered part 18 is initially moulded so that it extends from the upper end of the cylindrical portion 13 concentrically through the cylindrical portion 13 and the aperture defined by the flange 10, to project below the flange 10. Arranging the moulding of the seal device in this way substantially reduces the overall height of the moulding and consequently the cost of the mould. The height reduction is also convenient for subsequent storage and packaging.

At the time of use, or at a convenient time therefore, the tapered portion 18 may be displaced upwardly to occupy the position shown in FIG. 1, and will naturally retain that position.

I claim:

1. A weather seal device for providing a seal between a surface having longitudinal ridges and an elongate member extending therethrough, said device comprising an apertured base member of resilient deformable material to be located in use in superimposed relation on the surface with the elongate member extending through the aperture, a sleeve member of resilient material integral with the base member and projecting from one side thereof, said sleeve member enclosing said aperture in the base member so that in use the elongate member also extends through the sleeve member, the end of the sleeve member remote from the base member being adapted to in use sealably engage the exterior of the elongate member, said base member having a marginal edge portion extending along one edge of the base member,a marginal portion spaced from the junction of the sleeve member and the base member and to in use be positioned to extend in a direction generally inclined and across the direction of the longitudinal ridges of the surface, said marginal edge portion being contoured along its length in a direction normal to the plane of the base member, so that the length of the marginal edge portion measured along the contours is greater than the linear length thereof, when the measurements are made when the edge portion is in the free as produced state, said base member in the free, as-produced state having a substantially flat area between the contoured marginal edge portion and the junction of the base member and the sleeve member, said contours in the marginal edge portion in use being deformed to follow the contour of the surface having longitudinal ridges with limited alteration of the linear length of the marginal edge.

2. A weather seal device as claimed in claim 1 wherein a strip of non-resilient manually deformable material is secured to said marginal edge portion of the base member along substantially the length thereof and follows the contour thereof, whereby the strip and the marginal edge portion of the base member secured thereto may be non-resilient deformed to complement the contour of the surface to which it is to be fitted and when in use the marginal edge portion may be pressed between the strip and the surface to provide a weather-tight seal therebetween.

3. A weather seal device according to claim 2, wherein the base member has two marginal edge portions and said marginal edge portions that extend in a direction transverse to the strips of non-resilient manually deformable material are of resilient deformable material.

4. A weather seal device as claimed in claim 2, wherein the strips are made of aluminium.

5. A weather seal device as claimed in claim 1 wherein two marginal edge portions of the base member are contoured along their length, said marginal edge

portions being located on opposite sides of the sleeve member.

6. A weather seal device as claimed in claim 5 having a strip of non-resilient manually deformable material secured to each of said two marginal edge portions.

7. A weather seal device as claimed in claim 1 wherein the contour of the marginal edge portion extends from said portion inwardly of the base member toward the sleeve member.

8. A weather seal device as claimed in claim 7 wherein the height of the contouring above the plane of the base member is progressively decreased from the marginal edge portion inwardly towards the sleeve member.

9. A weather seal device as claimed in claim 1 wherein the sleeve member has a substantially cylindrical lower portion at the lower end and an upwardly tapered upper portion.

10. A weather seal device as claimed in claim 9 wherein the cylindrical lower portion has a wall thickness greater than the thickness of the flange and of the tapered upper portion adjacent the respective ends of the cylindrical portion.

11. A weather seal device as defined in claim 1 wherein a marginal edge portion to be secured in use to a surface having longitudinal ridges, said marginal edge portion being made of a resilient material and contoured along its length in a direction normal to the plane of the edge portion so that in a free state the length of the edge portion measured along the contours is greater than the linear length thereof.

12. A weather seal device as claimed in claim 11 wherein a strip of non-resilient deformable material is secured to said marginal edge portion along substantially the length thereof and follows the contour thereof, whereby the strip and the marginal edge portion secured thereto may be non-resiliently deformed to complement the contour of the surface to which it is to be fitted, and when in use the marginal edge portion may be pressed between the strip and the surface to provide a weathertight seal therebetween.

13. The weather seal device as claimed in claim 1 wherein a portion of the sleeve member remote from the base member is formed concentric with another portion of the sleeve member adjoining the base member.

14. The device according to claim 13 wherein said another portion of the sleeve member is moulded with a thicker wall than the adjoined part of the remote section of the sleeve member.

15. The device according to claim 11 wherein said portion of the sleeve member remote from the base member is tapered towards the remote end of the sleeve member, and as moulded the remote end is below the base member.

* * * * *

United States Patent [19]

Hansen

[11] **Patent Number: 4,673,034**

[45] **Date of Patent: Jun. 16, 1987**

[54] **CASED WATER WELLS HAVING FLEXIBLE PAD**

[76] Inventor: **Donald J. Hansen**, 133 Elm St., Elkins, W. Va. 26241

[21] Appl. No.: **816,260**

[22] Filed: **Jan. 6, 1986**

[51] **Int. Cl.**[4] **E21B 33/02**

[52] **U.S. Cl.** ..... **166/75.1**; 166/81; 175/211; 277/212 F

[58] **Field of Search** ..... 166/81, 82, 84, 85, 166/88, 92, 75.1; 277/212 F; 175/211; 52/102

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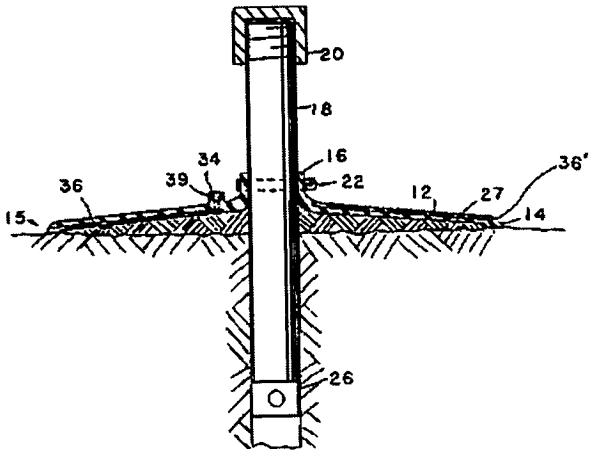
Primary Examiner—George A. Suchfield
Assistant Examiner—Terry Lee Melius
Attorney, Agent, or Firm—Curtis, Morris & Safford

[57] **ABSTRACT**

A cased water well comprising a generally tubular water well casing extending from subgrade to above grade. A flexible pad is attached to the water well casing for preventing aquifier contamination. The pad has an upwardly extending, generally tubular, flexible and water impermeable neck which is circumferentially continuous. The neck has an axially disposed opening which is adapted to be removably received over the upper terminus of the well casing and the neck is compressibly and sealingly attached to the outer surface of the well casing. A water impermeable flexible skirt is sealingly attached to the neck and extends radially outwardly a substantial distance in all directions from the neck. The flexible skirt has a lower surface which is adapted to be in contact with the earth and an upper surface which slopes continuously downwardly and outwardly from the neck to the outermost edges of the skirt.

10 Claims, 6 Drawing Figures



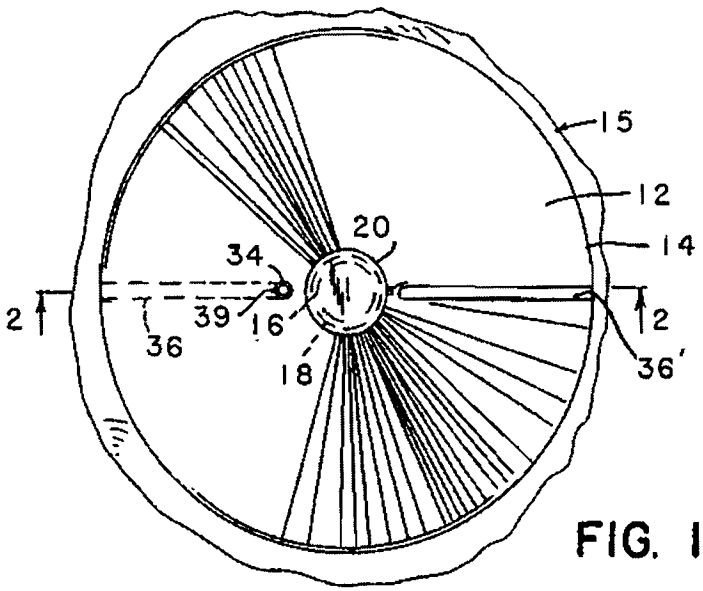


FIG. 1

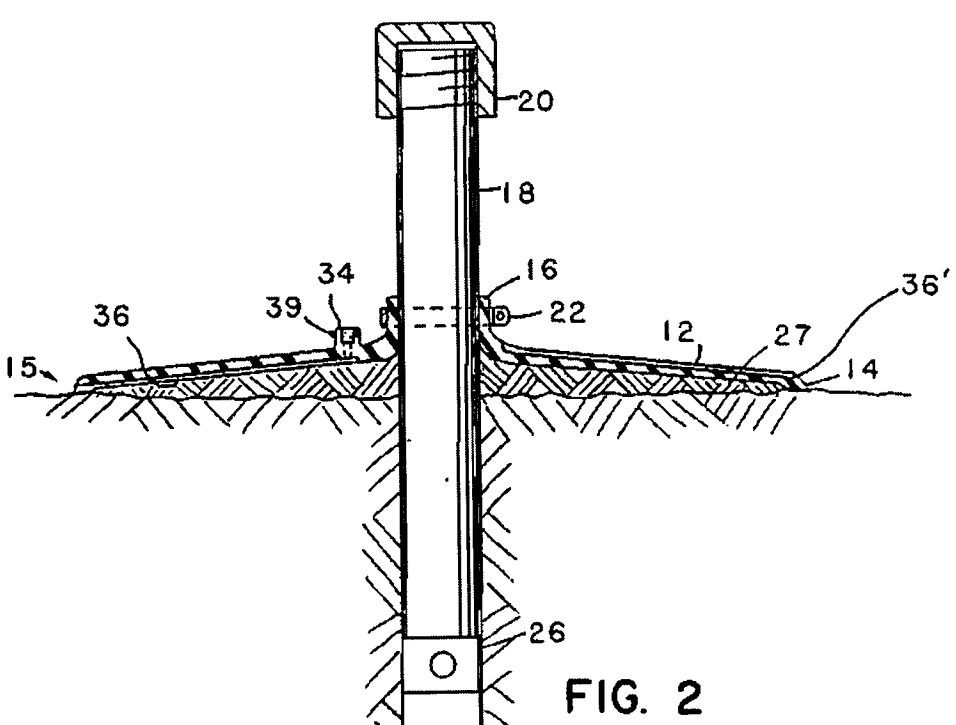


FIG. 2

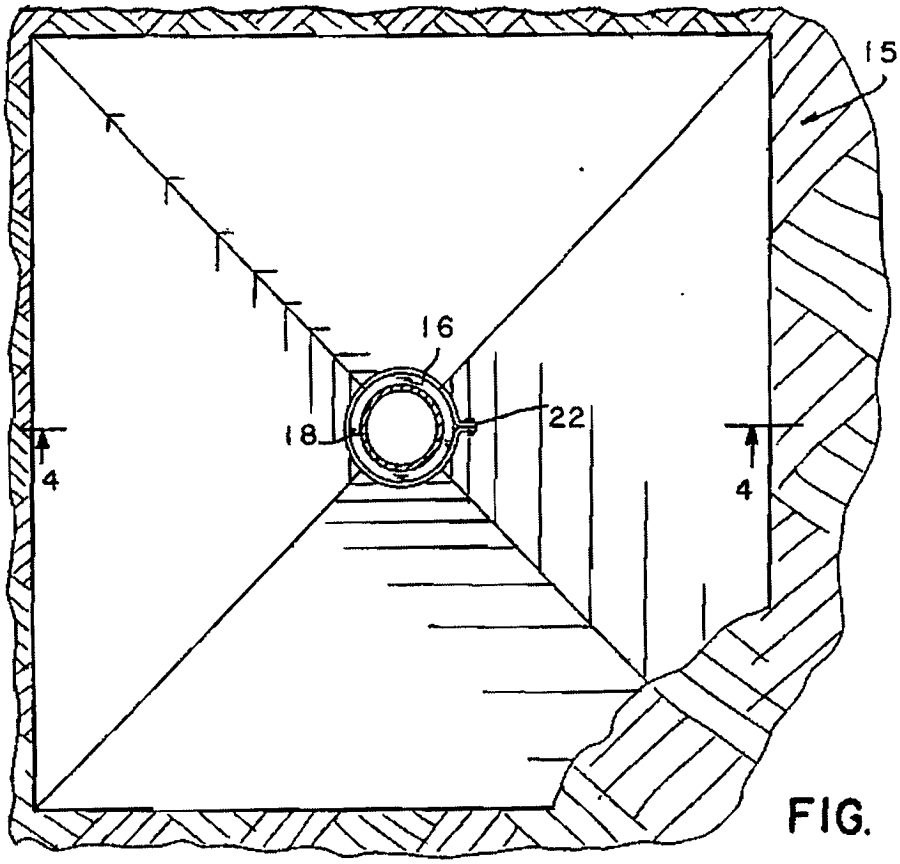


FIG. 3

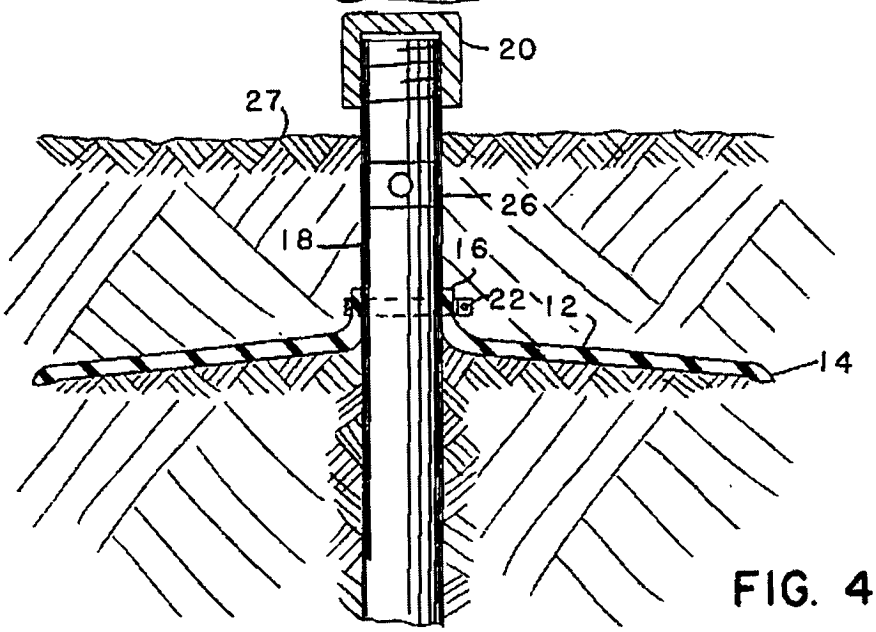


FIG. 4

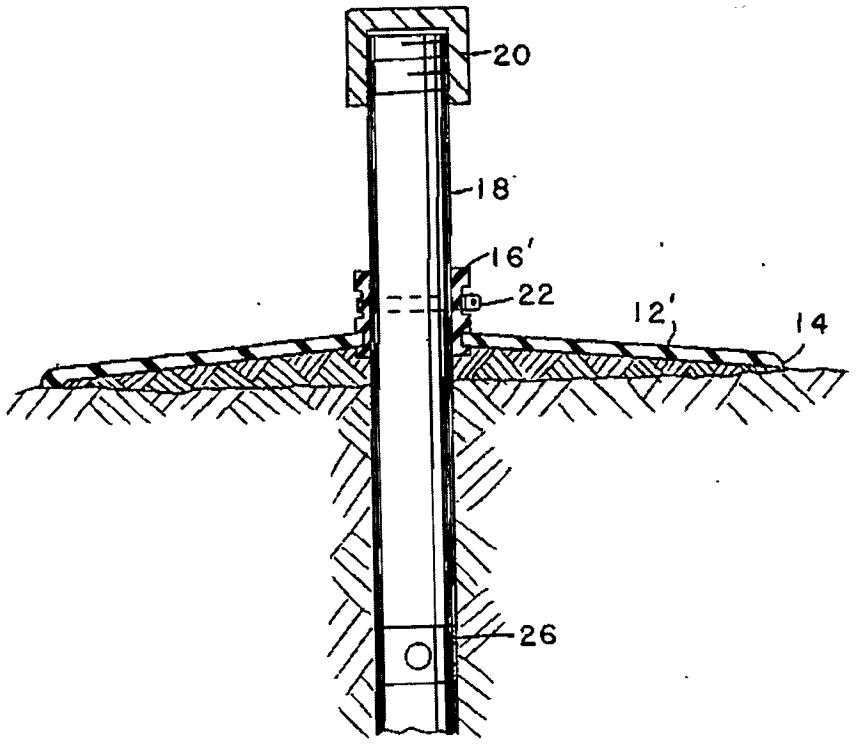


FIG. 5

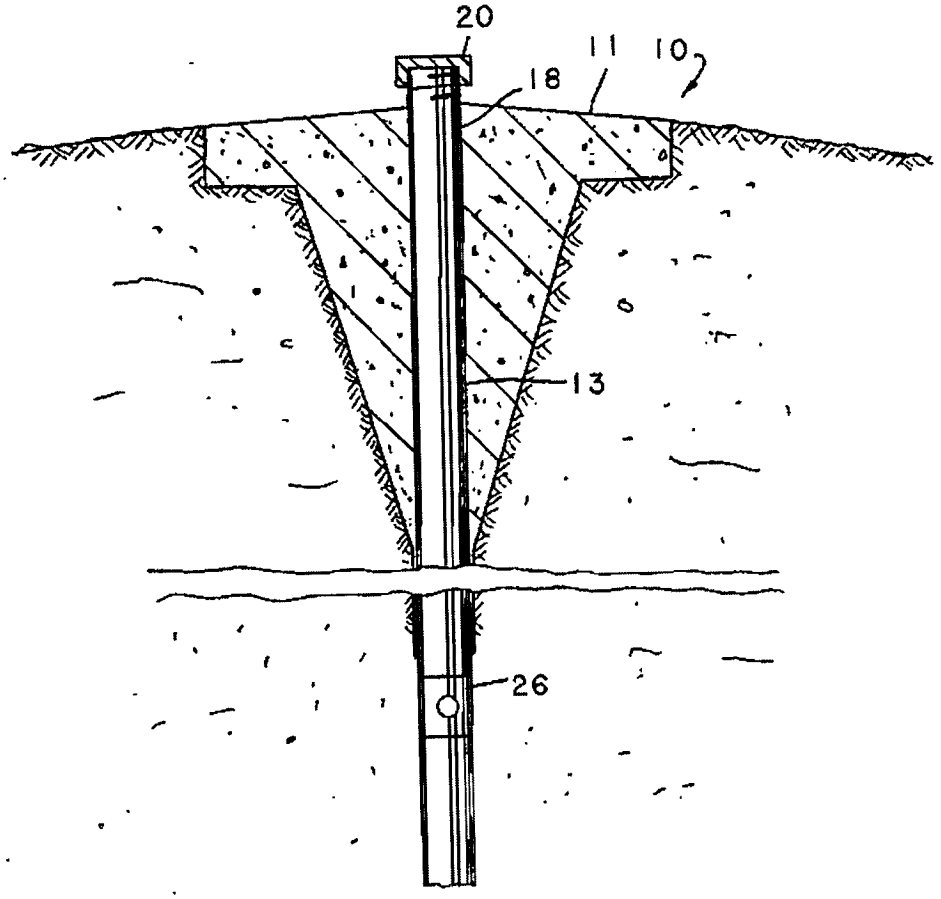


FIG. 6

CASED WATER WELLS HAVING FLEXIBLE PAD

FIELD OF THE INVENTION

The present invention relates to cased water wells and in particular to pads for such cased water wells.

BACKGROUND OF THE INVENTION

Water wells are commonly used for providing domestic water in rural areas and in some suburban areas. Such wells are commonly constructed by drilling, boring, or otherwise excavating a hole into the ground from the surface into a water-bearing stratum or aquifer. To prevent collapse of the hole, a generally tubular casing is inserted through the hole into the aquifer. This casing extends from the aquifer to above grade level, where the casing terminates and is typically covered by a sanitary well cap.

The casing will typically have an opening in it called a pitless well adapter for connection of piping for removal of the water. This opening is commonly placed below grade level, below the frost line, to prevent freezing of pipes attached to the opening in the casing. A pump or other means for extracting the water from the aquifer and raising it to the level of the opening in the casing is commonly attached at or near the upper terminus of the well casing, usually to the well casing itself.

Water found near the surface of soil, and indeed rain water itself, may contain significant contaminants. Furthermore, surface water will readily seep downwardly, or channel, immediately adjacent to the well casing. If contaminated surface water is allowed to contact the outside of the casing before it has percolated through several feet of soil to filter and purify the water through the action of bacteria, contaminated water can readily channel down adjacent to the casing and enter the aquifer, causing pollution.

To prevent this, cased water wells typically include a concrete pad surrounding the casing, and extending a substantial distance in all directions from the casing. This concrete pad has an upper surface which is sloped away from the casing so that rain water, dirt, oils from the pump or other contaminants will be drained away from the well casing to the outer edge of the concrete pad. Thus, surface water drained off the pad must percolate through several feet of soil before coming in contact with the outside of the casing.

The installation of this concrete pad is costly from the standpoint of time and material. Installing the concrete pad requires extra excavation of the soil around the upper portion of the well casing and a form for pouring the concrete.

The concrete pad must be free from cracks and the outside of the casing where it contacts the concrete must be sealed with a mastic or other sealant to prevent water from seeping through the concrete pad adjacent the outside of the casing at the point of entry of the casing. If the concrete pad is formed too soon after excavation of the soil around the casing, subsequent ground settling can cause cracking of the concrete which would defeat the purpose of the pad. Such ground settling can also cause rupturing of the mastic seal around the well casing, similarly defeating the purpose of the concrete pad. Furthermore, dirt can accumulate around the well casing at the point of entry through the concrete pad, contributing to weed and grass growth which, in turn, contributes to channeling of water through this point of entry down the outside of the casing.

The concrete pad may be installed either at or near grade level or below grade level, below the pitless well adapter. When installed at or near grade level, inspection or repair of the pitless adapter below the concrete pad requires a great deal of excavation below the pad which, in turn, subjects the concrete pad to the potential for cracking and rupture of the mastic seal. Furthermore, inspection and excavation under the concrete pad can be very dangerous to personnel. Installation of the concrete pad below the pitless well adapter to minimize these problems requires much more excavation and resultant expense. In either case, concrete can only be installed within a certain range of temperatures, which prevents the installation of wells during times of the year when temperatures are too cold.

OBJECTS OF THE INVENTION

Accordingly, it is an object of the present invention to provide a water impermeable pad for deflecting surface water away from a well casing which is simple and inexpensive to install.

It is a further object of the present invention to provide a water impermeable pad which is flexible and which can adjust to uneven ground surfaces to insure proper drainage of water away from the well casing.

It is a still further object of the present invention to provide a water impermeable pad which can be installed without regard to surrounding temperature conditions.

It is a yet further object of the present invention to provide a water impermeable pad which can be conveniently installed over the upper terminus of the well casing, and removed without damage to the water impermeable pad whenever maintenance is necessary.

SUMMARY OF THE INVENTION

These and other objects of the present invention are achieved by the use of a flexible pad for attachment to a water well casing. This pad has a water impermeable flexible skirt which has an opening generally centrally disposed therein for receiving the upper terminus of a water well casing therethrough. Means are provided for sealably attaching this skirt at that opening to the water well casing.

In a preferred embodiment of the present invention, the pad has an upwardly extending, generally tubular, flexible and water impermeable neck. The neck is circumferentially continuous and has an axially disposed opening therethrough which is adapted to be removably received over the upper terminus of the well casing. The neck is compressibly and sealingly attached to the outer surface of the casing so that the connection is watertight. The pad also includes a water impermeable flexible skirt sealingly attached to this neck extending radially outwardly a substantial distance in all directions from the neck. This flexible skirt has a lower surface adapted to be in contact with the earth and an upper surface sloping continuously downwardly and outwardly from the neck to the outermost edge of the skirt.

In another preferred embodiment of the present invention, the skirt is integral with the neck.

The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of an illustrative embodi-

ment thereof which is to be read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of the flexible pad of one preferred embodiment of the present invention;

FIG. 2 is a cross sectional view of the flexible pad of FIG. 1, shown installed onto a well casing at grade level;

FIG. 3 is a plan view of a flexible pad in accordance with another embodiment of the present invention;

FIG. 4 is a cross sectional view of the flexible pad of FIGS. 1 and 2, installed on the well casing below grade level;

FIG. 5 is a cross sectional view of the flexible pad of the present invention, with a separate skirt and neck-gasket; and

FIG. 6 is a cross sectional view of a concrete pad of the prior art, installed at grade level surrounding a well casing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 6, a cased water well having a concrete pad 10 in accordance with the prior art is illustrated. The concrete pad is formed in place around the well casing 18, and extends a substantial distance away from the well casing. The upper surface 11 of the concrete is sloped away from the well casing to provide drainage of surface water away from the casing. The concrete is formed in place and is rigid. To prevent water from seeping down between the casing and the concrete pad, a mastic or sealing compound 13 is installed between the concrete pad and the outside surface of the well casing.

Referring now to FIGS. 1 and 2, a flexible water impermeable pad 15 in accordance with one embodiment of the present invention is illustrated. The pad has a generally disc-shaped or circular skirt 12 with a continuous outer periphery or edge 14. This skirt is water impermeable and is dimensioned so that it extends radially away from the casing a substantial distance, preferably two feet or more. Further, its upper surface slopes away from the well casing continuously and downwardly in all directions. This ensures that any contaminants which may impinge on the skirt will be washed away from the well casing and avoids channeling of contaminated water adjacent to the well casing.

Skirt 12 of pad 15 should be made of a durable and flexible material, for example, rubber or neoprene or any suitable synthetic material. Preferably, skirt 12 is formed of a material which will withstand constant contact with the soil without undue degradation, since at least the lower surface of the flexible pad will constantly be in contact with soil. Furthermore, when the flexible pad is installed at grade level, the upper surface of the pad will be exposed to light and oxygen, and must also resist degradation from these environmental effects.

The skirt 12 connects to an upwardly extending generally tubular and circumferentially continuous neck 16 which is generally centrally disposed with respect to the outer edges of the skirt. Neck 16 is adapted to be received over the upper terminus of the well casing 18 when the sanitary cap 20 is removed. As illustrated in FIGS. 1 and 2, neck 16 is integral with skirt 12, although it is readily apparent that the neck could also be formed separately from the skirt, and suitably attached to the skirt in any suitable manner to prevent leakage between the neck and the skirt, such as gluing, heat sealing, or a bolt and gasket connection.

The neck 16 of the pad 15 should preferably be formed of a durable elastomeric material such as rubber or neoprene. These materials are sufficiently elastic to fit snugly over the well casing, and can be sealed watertight to the well casing conveniently with an ordinary compression hose clamp 22.

The skirt 12 can also be formed of other flexible materials such as polypropylene or similar plastics. In that case sealing of the pad to the well casing requires a separate elastomeric neck-gasket 16' between the skirt 12' and the well casing, as illustrated in FIG. 5, to seal the skirt to the well casing. When this construction is used, the neck-gasket 16' extends to the lowest surface of skirt 12'. In this manner, downward pressure on the upper-outside extremity of the skirt causes pressure against the lowest surface of the skirt to relieve stress around the compression hose clamp 22.

To install the flexible pad of the present invention onto a well casing, one excavates around the casing a sufficient distance so that the pitless well adapter 26 can be installed around the well casing. This excavation is then backfilled. The surface of the soil 27 surrounding the casing is built up and sloped away from the casing with approximately the same slope as is desired for the skirt 12 of flexible pad 15, when it is installed. The sanitary cap 20 is then removed from the upper terminus of the well casing, and the opening of the neck 16 of the flexible pad slipped over the upper end of the well casing and lowered until the lower surface of the flexible pad is resting on the sloped soil. The compression hose clamp 22 is then placed over the neck of the flexible pad and tightened, creating a secure, watertight seal between the neck and the well casing. Because the pad is flexible, the pad will not crack or break the seal between the neck and the well casing in the event of subsequent ground settling. Thus, the flexible pad can be installed immediately after backfilling the excavation. Furthermore, because the pad does not need to be formed in place, the pad can be installed in a wide variety of temperature conditions.

The pad of the present invention need not be circular as illustrated in FIG. 1, but can be any shape. Thus, the pad may have a rectilinear or square cross section, as illustrated in FIG. 3.

Under some circumstances, it may be advantageous to install the flexible pad below grade level, below the pitless well adapter. Such circumstances might be encountered in areas of such extreme cold or heat that even durable materials for the flexible pad might degrade unduly. Such a subsurface installation is illustrated in FIG. 4. The installation of the flexible pad of the present invention in subsurface installations is the same as with a grade level installation, except that additional excavation is required, and the pad is installed prior to installation of the pitless well adapter, so that the neck of the flexible pad may be conveniently slipped over the well casing without interference with the pitless well adapter. Furthermore, since underground pads are not subject to surface traffic and therefore need not be as flexible as above ground pads, underground pads can be constructed of less flexible materials, such as galvanized steel or similar metallic materials.

Because most pumping units for water wells are electric, it is usually necessary to have electrical conduit from the pump to a supply of electricity. It is therefore

preferable that the flexible pad incorporate provision for the electrical conduit. In the present invention, this is accomplished by providing an opening 34 in the skirt near the neck of the pad which is adapted to receive an electrical conduit down through the skirt. The lower surface of the skirt has a groove 36 which is adapted to receive the electrical conduit extending away from the neck of the flexible pad towards the supply of electricity. The opening for the electrical conduit also has a neck 34, similar in construction to the neck for the well casing. This neck can also be conveniently clamped around the electrical conduit with a compression hose clamp 39 to create a water tight seal between the neck and the electrical conduit. Alternately or in addition, a water impermeable conduit grove 36', as shown in FIG. 1, can be provided by molding, stamping, or other convenient means on the upper surface of the skirt 12. With the upper surface groove 36', it is not necessary to provide the neck 34 and hose clamp 39. Thus, the electrical conduit is neatly provided for while retaining the water impermeable features of the flexible pad of the present invention.

It is thus seen that the present invention, provides a water impermeable pad which is flexible, easy to install regardless of temperature conditions, resistant to cracking, and which positively seals against the well casing to prevent undesirable channeling of potentially contaminated water into the aquifer and can be conveniently and safely removed and replaced when maintenance is required.

What is claimed is:

1. A device for preventing external liquid borne contaminants from entering the aquifer of a tubularly cased water well by channeling down around the outside of the casing, said device comprising a water impermeable flexible skirt which is peripherally continuous extending a substantial radial distance away from said casing, said skirt having an opening generally centrally disposed therein for removably receiving the upper terminus of a water well casing therethrough, and means for removably sealingly attaching said skirt to the outer surface of said wter well casing at a fixed location a substantial distance below said terminus.

2. A device for preventing external liquid borne contaminants from entering the aquifer of a tubularly cased water well by chameling down around the outside of the casing, said device comprising:

an upwardly extending, generally tubular, flexible and water impermeable neck which is circumferentially continuous, said neck having an axially disposed opening therethrough which is adapted to be removably received over the upper terminus of said casing, said device further having means for compressibly and removably sealingly attaching said neck to the outer surface of said casing;

a water impermeable flexible skirt which is peripherally continuous sealingly attached to said neck and extending radially outwardly a substantial distance in all directions from said neck, said flexible skirt having a lower surface adapted to be in contact with the earth and an upper surface, said upper surface sloping continuously downwardly and outwardly from said neck to the outermost edge of said skirt.

3. The device defined in claim 2, wherein said skirt is generally rectilinear and said neck is generally centrally disposed with respect to the edges of said skirt.

4. The device defined in claim 2, wherein said skirt is generally circular and said neck is generally centrally disposed with respect to the edges of said skirt.

5. The device defined in claim 2, wherein said skirt is integral with said neck.

6. The device defined in claim 2, wherein said skirt is constructed of an elastomeric material.

7. The device defined in claim 2, wherein said skirt further comprises a molded-in groove in said lower surface of said skirt extending radially outward from the region of said skirt nearest said casing to the edge of said skirt, said groove being adapted to receive an electrical conduit.

8. A cased water well comprising:

a generally tubular water well casing extending from subgrade to above grade, said casing having an opening therein for removing water therefrom;

a device for preventing external liquid borne contaminants from entering the aquifer of a tubularly spaced water well by channeling down around the outside of the casing, said device comprising:

an upwardly extending, generally tubular, flexible and water impermeable neck which is circumferentially continuous, said neck having an axially disposed opening therethrough which is adapted to be removably received over the upper terminus of said casing, said device further having means for compressibly and removably sealingly attaching said neck to the outer surface of said casing at a fixed location a substantial distance below said terminus;

a water impermeable flexible skirt which is peripherally continuous sealingly attached to said neck and extending radially outwardly a substantial distance in all directions from said neck, said flexible skirt having a lower surface adapted to be in contact with the earth and an upper surface, said upper surface sloping continuously downwardly and outwardly from said neck to the outermost edge of said skirt.

9. The cased water well as defined in claim 8, wherein said device is disposed substantially below grade level and covered with fill.

10. The cased water well as defined in claim 8, wherein said flexible skirt is integral with said neck.

* * * * *

United States Patent [19]

Tiegs et al.

[11] **Patent Number: 4,676,513**

[45] **Date of Patent: Jun. 30, 1987**

[54] **ONE-PIECE SPLIT BOOT FOR UNIVERSAL JOINT**

[76] Inventors: **Del V. Tiegs**, 15878 E. Wind Cir., Sunrise, Fla. 33326; **Randy G. Tiegs**, 20631 NW. Miami Ct., Miami, Fla. 33169

[21] Appl. No.: **840,514**

[22] Filed: **Mar. 17, 1986**

[51] **Int. Cl.**[4] **F16J 15/52**

[52] **U.S. Cl.** ..... **277/212 FB**; 277/199; 277/215; 74/18; 403/51

[58] **Field of Search** ..... 277/212 R, 212 FB, 203, 277/204, 215, 199; 74/18, 18.1, 18.2; 403/50, 51

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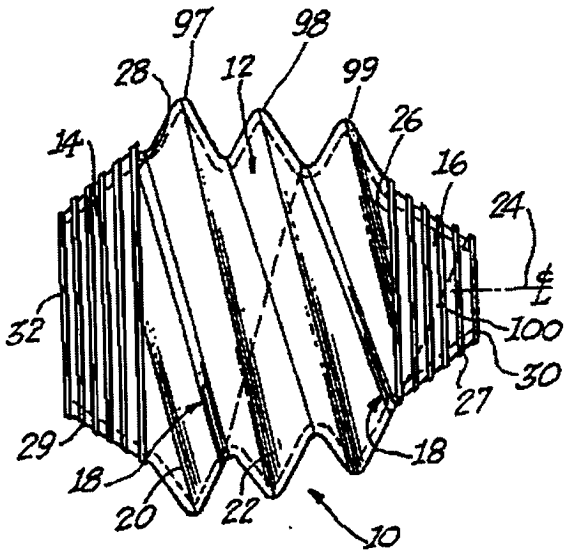
Primary Examiner—Robert S. Ward
Attorney, Agent, or Firm—Malin, Haley & McHale

[57] **ABSTRACT**

A split boot formed from a unitary, flexible body shaped to be helically wrapped around a universal joint or the like. Once the flexible body is wrapped around the joint with the mating edges engaged a main body is formed having a generally hollow truncated conical configuration with a corrugated or helical shape. One end of the main body has a smaller circular cross section than the other end. Each end portion of the main body has cutting guide ridges such that the diameter of the aperture in the end may be varied by removing some of the material from the body.

11 Claims, 9 Drawing Figures



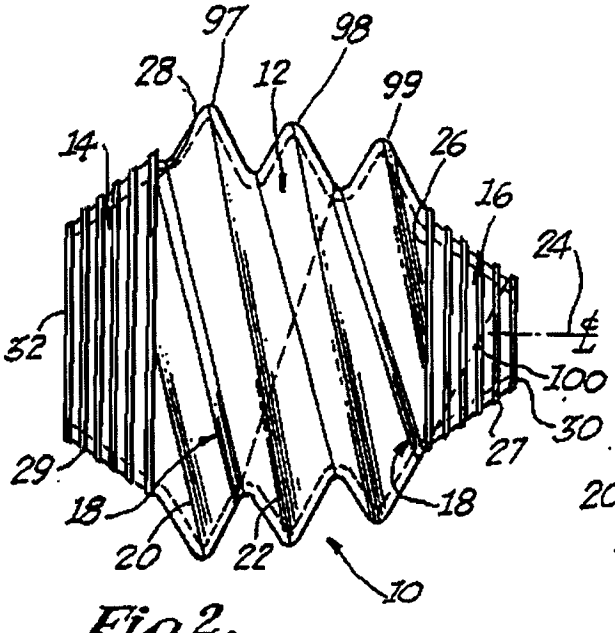


Fig.2.

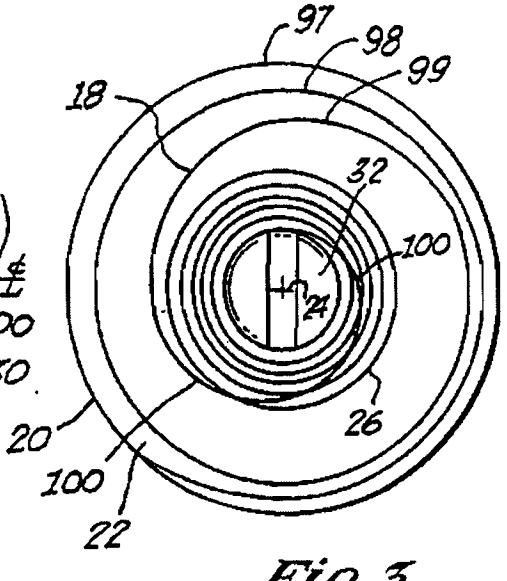


Fig.3.

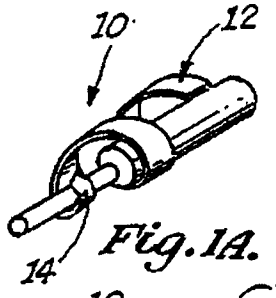


Fig.1A.

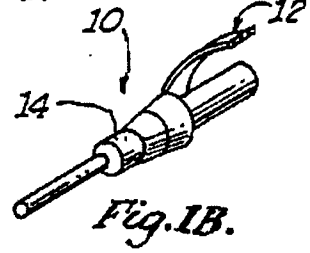


Fig.1B.

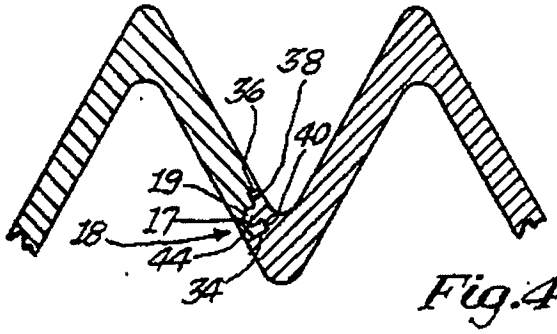


Fig.4.

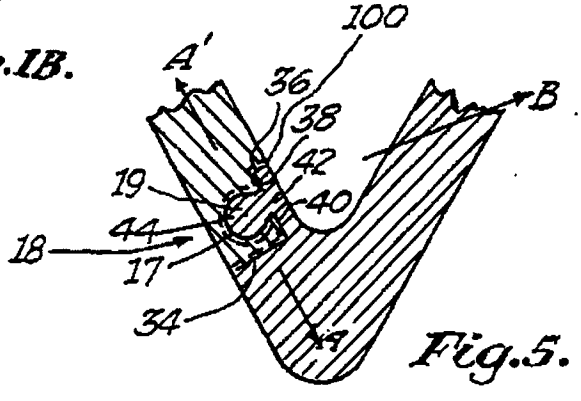


Fig.5.

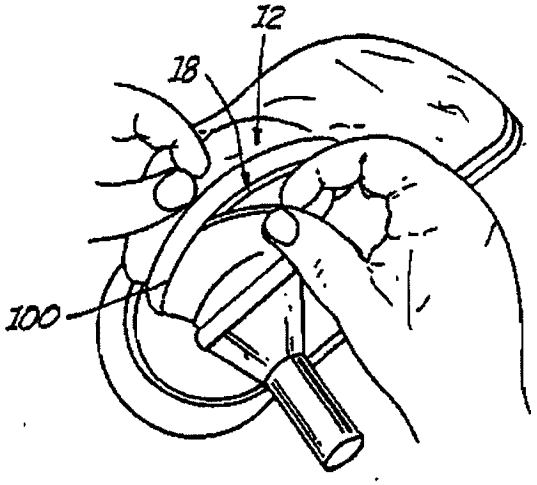


Fig. 6.

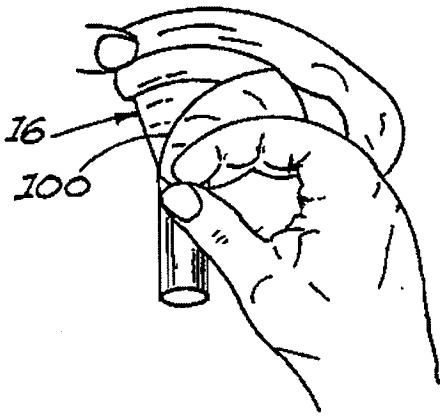


Fig. 7.

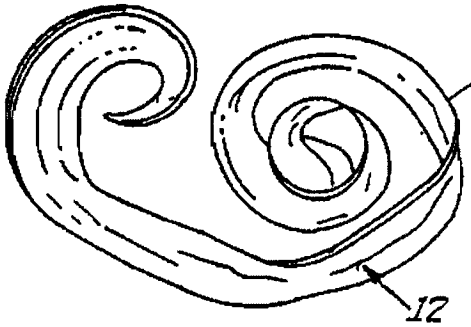


Fig. 8.

ONE-PIECE SPLIT BOOT FOR UNIVERSAL JOINT

BACKGROUND OF THE INVENTION

The present invention relates to boots for covering universal joints and the like and more particularly to unitary, flexible body having a first mating edge and second mating edge and shaped to be helically wrapped about a universal joint, coupling or other type of structure without disassembling the structure in which the first mating edge is engaged with the second mating edge thereby forming a removable boot for the universal joint or the like.

In the past, a structure such as a C.V. joint on front wheel drive vehicles had to be disassembled to replace a damaged boot. Such procedures prove to be both costly and time consuming. Furthermore, boots having cracks, tears or loose clamps or other types of damage may lose lubricant, or allow water or dirt to enter the boot, causing eventual deteriation of the joint. Other procedures have been attempted to replace damaged boots. For example, a boot may be cut down the side and placed over the C.V. joint and glued back together. However, this procedure is difficult to perform because the cut area must be clean and the reglued area must be further supported using extra clamps. The work area is usually greasy and almost impossible to keep clean. Any grease on the cut area of the boot will prevent it from being properly sealed. Any cracks left in the seal will allow dirt and water to enter and the lubricant to leak out.

The boot of the present invention does not require a clean area, and in fact the boot will be sufficiently sealed even if some grease accumulates in the sealing area. Furthermore, the present invention does not require additional clamps to attach it to the joint or the like and by providing truncated conical end portions with cut away portions thereon the invention allows for alterations of the boot to fit structures of varying size. In addition, the present invention may be removed and replaced without disassembling the mechanical unit it covers.

SUMMARY OF THE INVENTION

The present invention provides a split boot formed from a unitary, flexible body shaped to be helically wrapped around a universal joint or the like. Once the flexible body is wrapped around the joint with the mating edges engaged a main body is formed having a generally hollow truncated conical configuration with a corrugated or helical shape. In the preferred embodiment one end of the main body has a smaller circular cross section than the other end. Each end portion of the main body has cutting guide ridges such that the diameter of the aperture in the end may be varied by removing some of the material from the body, to accomodate different sized joints or mechanical units. The corrugations or the helical shape in the main body are diagonally disposed relative to the longitudinal axis of the main body to provide longitudinal flexibility and for providing the recirculation of lubricating oils during rotational movement of the boot with a rotating mechanical unit and to equalize rotational forces on the boot to prevent premature rupture and cracking thereof.

It is an object of the present invention to provide a novel split boot that is easily used and sealingly connects or mates around a universal joint or the like without disassembly of the joint.

It is another object of the present invention to provide a novel split boot having helical overlapping snap sealing means for making it easy to install and remove the boot from a universal joint or the like.

It is a further object of the present invention to provide a novel split boot having a corrugated shape with the corrugations being generally diagonally disposed relative to the longitudinal axis of the boot which facilitates recirculation of the lubricating oil contained therein.

It is an additional object of the present invention to provide a split boot having a sealing means positioned so that the sealing means is not subject to premature cracking, rupturing and opening thereof.

In accordance with these and other objects which will be apparent hereinafter, the instant invention will now be described with particular reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings

FIG. 1A is a plan view of the split boot of the present invention disassembled;

FIG. 1B is a plan view of the split boot partially assembled;

FIG. 2 is a side view of the split boot of present invention in final sealed and assembled form;

FIG. 3 is a right end view of the split boot of the present invention in final sealed form;

FIG. 4 is a partial cross sectional view of the main body 10 of FIG. 1;

FIG. 5 is an enlarged view of the sealing means of FIG. 4;

FIG. 6 is an illustration of connecting the connecting means on the main body;

FIG. 7 is an illustration of connecting the connecting means on the end portion;

FIG. 8 is an illustration of the split boot in an unconnected configuration.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1A, 1B and 2, the split boot 10 covers a mechanical unit such as joint or rotating C.V. joint. The split boot 10 includes a unitary main body portion 12, two end portions 14 and 16, a grooved mating edge 17 and a male mating edge 19 in FIG. 4. The grooved mating edge 17 may be engaged by the male mating edge 19 to form a connecting means 18 in FIGS. 2 and 3. The connecting means is positioned so that centrifugal force from rotation about the center line 24 does not pull male member 19 directly out of female member 17. The boot 10 may be constructed entirely out of Ethylene-Neoprene rubber such as that sold under the trademark VAMAC by DuPont. When the interlocking sealing means 18 is disengaged the entire boot 10 may be laid down in a flat configuration as shown in FIG. 1. This allows the boot to be installed about a structure such as a universal joint, coupling or other type of structure without disassembling the structure.

Referring now to FIG. 2, the body 10 has a main body portion 12 of a generally hollow truncated conical corrugated configuration or helical when assembled. As can be seen the plane of each protruding corrugated

portion 20 and 22 is diagonally disposed relative to the longitudinal axis 24 of the main body 10. (i.e. The plane of each protrusion is not normal to the axis). The corrugated configuration provides for recirculation of the lubricating oil when rotational movement of the universal joint or the like occurs. The oil moves in the screw-like threads. The corrugated configuration also provides for equalization of forces caused by rotational movement of the boot thus preventing premature cracking or rupturing of the boot. In FIG. 3 the size of the corrugated portions are illustrated by numerals 97, 98 and 99.

The main body 12 has a smaller circular top 26 and a larger circular base 28. The two truncated conical end portions 14 and 16 emanating from the circular bases 28 and 26 respectively have circular top openings. The end portions include sizing guides 27, 29 that allow accurate trimming of the boot 10 to specific sizes, such that the one boot will accomodate the needs for most vehicles.

Referring now to FIGS. 4 and 5, the first grooved mating opening or edge 17 and the complementary male mating bulb or edge 19 is shown in the removably engaged position and may be referred to as a connecting means. When the grooved mating edge 17 is not engaged by the male mating edge 19, the edge portions of the main body 10 are separated from each other allowing the main body 10 to be wrapped around a structure without disassembling it. Numeral 100 shows the separation line in FIGS. 2 through 5. The grooved mating edge 17 includes an end portion 34 and a flat portion 38, while the male mating edge 19 includes the end portion 36 and the flat portion 40 all which together form the removable connecting means 17, 19. The male mating edge 19 includes a flange 42 and a bulbus end 44 that fits in the grooved mating edge 17 of a complementary shape. The configuration of the connecting means 17, 19 resists opening forces in the directions shown by the arrows AA', while the material around the bulbous end 42 provides for resistance to opening in the direction of arrow B. The connecting means 17, 19 also provides for periodic non-destructive removal of the boot 10 in FIG. 2 for inspection of the structure thereunder and regreasing if necessary, and resealing of the boot. The split boot may be made out of rubber or neoprene type material.

The instant invention has been shown and described herein in what is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

What is claimed is:

1. A one piece universal joint boot comprising:
- a relatively large hollow body sized in length and width and shaped for encompassing a plurality of universal joints of varying sizes;
- said hollow body having a longitudinal body center line;
- said hollow body including means for varying the effective length of said hollow body to fit over a plurality of universal joints of varying size;
- said hollow body having relatively small conical connecting means at each end of said hollow body;
- each said connecting means including opening for universal joint shafts;
- said conical connecting means including universal joint shaft diameter ring shaped sizing guides means connected on said connecting means, said sizing guide means for facilitating accurate trimming a portion of said conical connecting means of said boot to accomodate different universal joint shafts.

2. A one piece universal joint boot as set forth in claim 1, wherein:
- said means of said hollow body including a corrugated or accordian configuration.

3. A one piece universal joint boot as set forth in claim 2, wherein:
- said hollow body is in the form of a three dimensional spiral of at least three hundred and sixty degrees.

4. A one piece universal joint boot as set forth in claim 2, wherein:
- said hollow body having an outer edge of a relatively larger diameter in a spiral configuration and a lower edge of a relatively smaller diameter in a spiral configuration to form a conical shaped corrugated or accordian configuration.

5. A one piece universal joint boot as set forth in claim 4, wherein:
- said conical shaped corrugated or accordian configuration providing a lubricant moving means for lubricating said universal joint in said universal joint boot.

6. A one piece universal joint boot as set forth in claim 1, wherein:
- said joint boot is split longitudinally generally along a spiral line.

7. A one piece universal joint boot as set forth in claim 3, wherein:
- said joint boot is split longitudinally generally along a spiral line.

8. A one piece universal joint boot as set forth in claim 5, wherein:
- said joint boot is split longitudinally generally along a spiral line.

9. A one piece universal joint boot comprising:
- a relatively large hollow body sized in length and width and shaped for encompassing a plurality of universal joints of varying sizes;
- said hollow body including a spirally positioned releasable line connector means for connecting said hollow body into a boot and for disconnecting said hollow body to provide a flat configuration, said connector means allowing said boot to be connected over a universal joint without first disconnecting said universal joint;
- said hollow body generally conical in shape when said connecting means are connected together;
- said hollow body having a longitudinal body center line;
- said hollow body including means for varying the effective length of said hollow body to fit over a plurality of universal joints of varying size;
- said hollow body having relatively small conical connecting means at each end of said hollow body;
- each said connecting means including opening for universal joint shafts;
- said conical connecting means including universal joint shaft diameter ring shaped sizing guides means connected on said connecting means, said sizing guide means for facilitating accurate trimming a portion of said conical connecting means of said boot to accomodate different universal joint shafts;
- said connecting means including:
- a first mating portion integral one edge of said hollow body;

a second mating portion integral the other edge of said hollow body;

said second mating portion non-destructively, removably engageable with said second mating portion whereby said boot is formed.

10. A one piece universal joint as set forth in claim 9, wherein:

said first mating portion includes a substantially longitudinal slot with a substantially circular-shaped groove therein;

said second mating portion includes a bulbous protruding portion sized and shaped for engagement with said substantially circular-shaped groove.

11. A one piece universal joint as set forth in claim 10, wherein:

said second mating portion engages said first mating portion in a direction normal to the plane of each protruding portion of said corrugated portion whereby separation of said connecting means is prevented during rotation of said boot.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,676,513

DATED : 6/30/87

INVENTOR(S) : Del V. Tiegs and Randy G. Tiegs

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 9, Column 4, Line 49, "connecting" should be --connector--.

Claim 9, Column 4, Line 61, after "on said" insert --conical--.

Claim 9, Column 4, Line 66, "connecting" should be --connector--.

Claim 9, Column 5, Line 4, "second" should be --first--.

Claim 11, Column 6, Line 9, "connecting" should be --connector--.

This certificate supersedes Certificate of Correction issued August 30, 1988,

Signed and Sealed this

Twenty-seventh Day of September, 1988

Attest:

DONALD J. QUIGG

Attesting Officer *Commissioner of Patents and Trademarks*

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,676,513
DATED : 6/30/87
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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 9, Column 4, Line 49, "connecting" should be --connector--.

Claim 9, Column 4, Line 57, "connecting" should be -- connector--.

Claim 9, Column 4, Line 61, after "on said" insert --conical--.

Claim 9, Column 4, Line 66, "connecting" should be --connector--.

Claim 9, Column 5, Line 4, "second" should be --first--.

Claim 11, Column 6, Line 9, "connecting" should be--connector--.

Signed and Sealed this

Thirtieth Day of August, 1988

Attest:

Attesting Officer

DONALD J. QUIGG

Commissioner of Patents and Trademarks

[redacted]

United States Patent [19]

Leeland

[11] **Patent Number: 4,730,421**

[45] **Date of Patent: Mar. 15, 1988**

[54] **PITCH BOX**

[76] Inventor: **David F. Leeland, R.D. 1, Box 150, Denver, Pa. 17517**

[21] Appl. No.: **943,604**

[22] Filed: **Dec. 18, 1986**

[51] Int. Cl.[4] **E04D 1/36**

[52] U.S. Cl. **52/58; 52/219; 285/42; 98/82**

[58] Field of Search 52/58–62, 52/218, 219; 285/42–44; 126/314–319; 98/82

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Primary Examiner—James L. Ridgill, Jr.
Attorney, Agent, or Firm—Dann, Dorfman, Herrell and Skillman

[57] **ABSTRACT**

A pitch box for sealing the junction between an upright elongated projection and the opening where it penetrates into the surface of a roof. The pitch box has a central tubular part which has a base adapted to be mounted against the roof surface surrounding the projection and adapted to extend upwardly generally coaxial with the longitudinal axis of the projection to provide a space surrounding the extension for receiving anchoring material. A collar surrounds the upper end of the tubular part and a bottom wall is provided between the bottom of the collar and a median point on the tubular part so that a trough is formed surrounding the upper end of the tubular part. The bottom of the trough has weep holes in it for discharging moisture. The top of the collar extends above the top of the tubular part. A porous material may be used to fill the bottom of the trough and the top of the collar is filled with tar or other sealant material which can be mounded up around the projection which extends upwardly through the pitch box.

10 Claims, 4 Drawing Figures

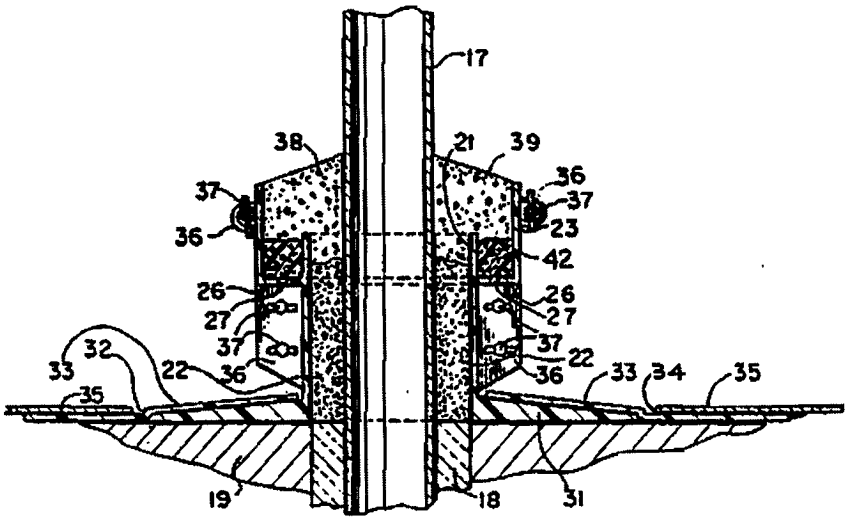

FIG. 1

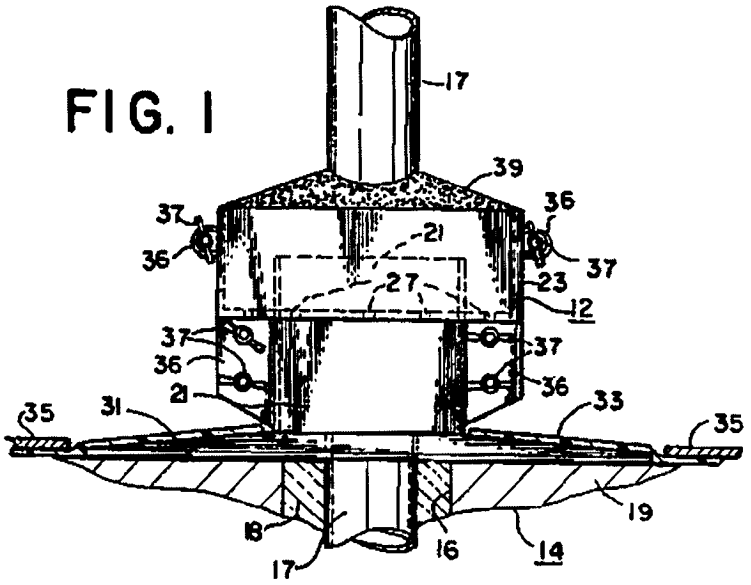
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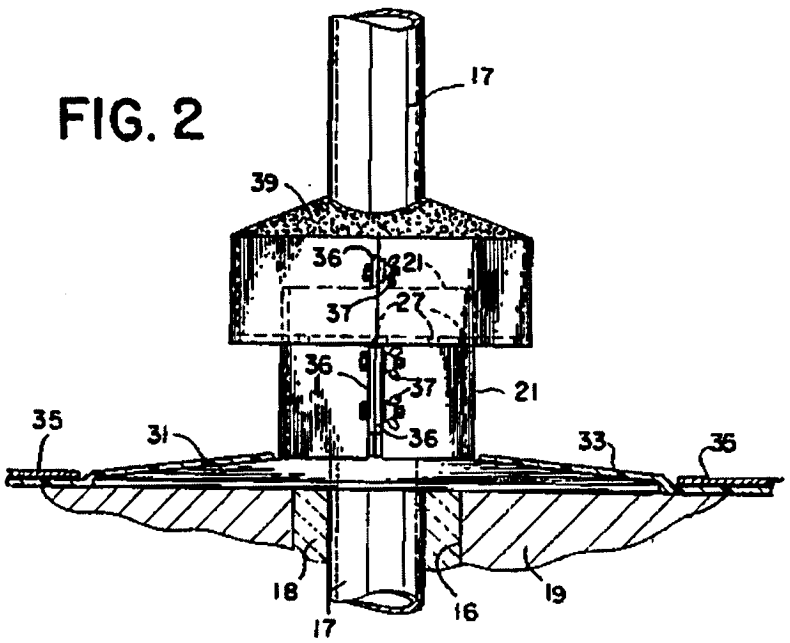
FIG. 2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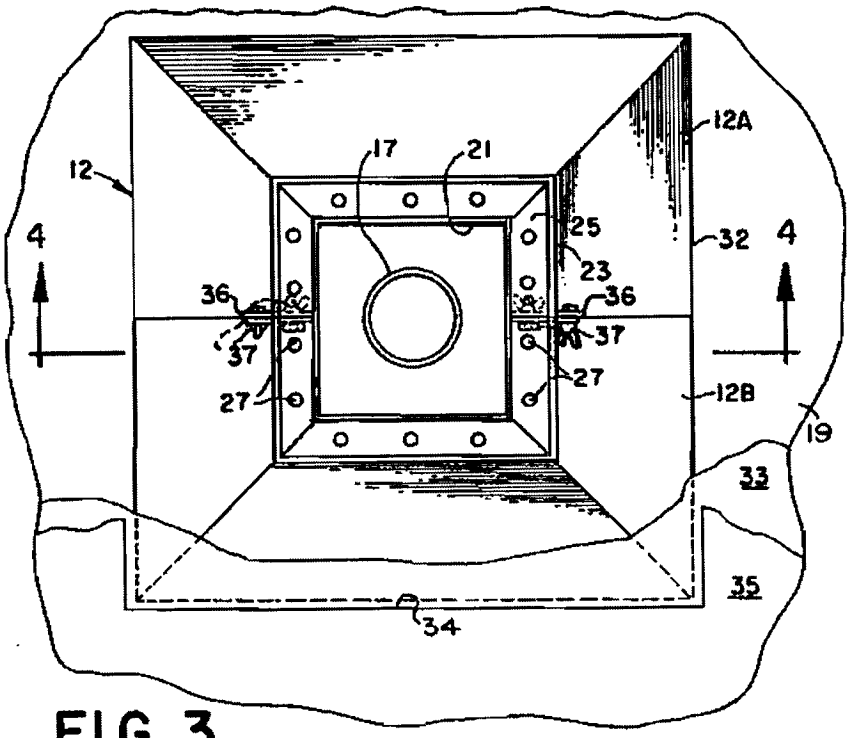
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FIG. 3

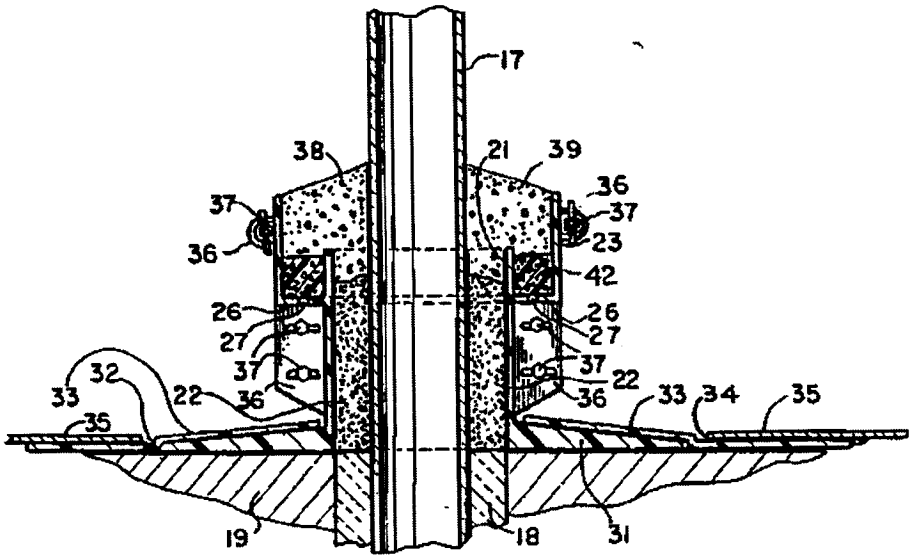
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FIG. 4

PITCH BOX

FIELD OF THE INVENTION

The field of the invention relates to roof construction, and has particular application to apparatus for use in making a seal around a pipe or other projection penetrating the roof surface.

BACKGROUND OF THE INVENTION

In the construction of roofs, it is common practice to use flashing components around the perimeter of the roof, and particularly where the roof meets a vertical wall. Where the wall is planar, there is little difficulty in installing flashing which bridges any gap which might exist between the upstanding wall and the roof surface. Where there is a projection through an opening in the roof surface within the perimeter, for example when a vent pipe or air-conditioning conduit penetrates the roof surface, there is difficulty in providing a long-lasting seal between the projecting element and the roof surface, particularly where the projecting element is round or is of irregular contour.

DESCRIPTION OF THE PRIOR ART

Prior to the present invention, the common practice for sealing such projections consists of erecting a dam in spaced relation surrounding the projection and filling up the space between the dam and the projection with pitch or tar so as to effect a weather-proof seal between the roof surface and the projecting element. In many cases, the dam is provided by a pitch box which consists of a ring, circlet, or or other annulus adapted to be mounted on the roof surface with an upstanding wall to provide an annular receiving space surrounding the projection and overlying the opening. In order to firmly anchor the pitch box in place, a thick layer of mortar is deposited within the annulus at the roof level to firmly anchor the pitch box in place and above the mortar, pitch or tar is deposited within the annulus and is mounded up in the center toward the projection so that water running down the projection above the pitch box is deflected away from the surface of the projection.

After a time, the pitch in the pitch box tends to shrink and provide a degree of clearance between the pitch and the pitch box or else between the pitch and the projection. The clearance provides one or more small passages which attract water and permit it to penetrate into the pitch box below the tar and work its way into the opening in the roof structure where the projection penetrates. After a period, the passages may permit a substantial accumulation of moisture surrounding the projection in the opening and on the undersurface of the roof which may manifest itself as leakage into the building.

In an attempt to overcome the problem, gasketing material has been used to effect a seal either between the projection and the pitch box or else between the pitch box and the roof, or both. While effective in the short run, exposure to the elements over a period of time deteriorates the gasketing material and it loses its effectiveness. Furthermore, gasketing is expensive, particularly where the projection is of irregular contour.

SUMMARY OF THE INVENTION

The present invention provides an improved pitch box which enables the roof to be constructed using conventional tools and procedures and yet which provides an improved seal between the roof surface and an element projecting from an opening in the roof surface.

More specifically, the present invention provides an improved pitch box having a configuration which avoids the ill effect of leakage between the pitch and the box which may occur after a period of use.

Even more specifically the present invention provides a pitch box which is designed to divert any leakage which may occur into the pitch box away from the roof opening which the projecting element penetrates.

The preferred embodiment of the invention includes a recessed trough portion in the pitch box spaced outwardly from the projecting element and having weep holes in the bottom thereof so that any leakage within the pitch box is received in the trough and is discharged through the weep holes onto the roof surface for dissipation.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention is illustrated in the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a pitch box installed on a flat roof, the roof being shown in section;

FIG. 2 is a plan view of the pitch box of FIG. 1 with the flashing and the roofing membrane broken away;

FIG. 3 is a plan view of the pitch box shown in FIGS. 1 and 2, but with the filler material and the sealant removed for the purpose of illustrating the interior construction of the box; and

FIG. 4 is a sectional view taken along the line 4—4 of FIG. 3.

DESCRIPTION OF A PREFERRED EMBODIMENT

With reference to the drawing, FIG. 1 illustrates a pitch box 12 made in accordance with the present invention applied to a roof 14 of substantially standard construction. The roof has an opening 16 through which a projection, in the present instance a vent pipe 17, penetrates. In accordance with the usual practice, insulation material 18 is stuffed into the opening 16 between the walls of the opening and the pipe 17. The body of the roof 14 may be of any suitable construction providing a flat surface 19 immediately surrounding the opening 16 on which the pitch box 12 may be mounted.

As shown in the drawings, the pitch box 12 is annular in form having a square tubular core 21 extending from its lower limit upwardly a substantial distance. The core 21 has a hollow center which is sufficiently larger than the diameter of the vent pipe 17 to accommodate filler material 22 between the core 21 and the vent pipe 17.

At the upper end, the pitch box is provided with an annular collar 23 spaced radially outward from the core 21 and overlapping the upper marginal end of the core 21. Preferably, the collar 23 comprises a hollow square which is coaxial with the core 21 and with the vent pipe 17 so as to provide a peripheral annular channel or trough 25 between the core 21 and the collar 23. A bottom wall 26 is provided to define the lower limit of the channel 25 and extends from the bottom of the collar inwardly to meet the core 21 at a position spaced below its upper end. As set forth more fully hereinafter, the bottom wall 26 is preferably horizontal and has a series of weep holes 27 positioned along the lowest part therein.

At its base, the core 21 merges into an outwardly-annular base or flange portion 31 having a flat portion

adapted to bear against the upper surface of the roof structure 19 to support the core portion 21 with its central axis disposed vertically, coaxial with the axial center line of the pipe 17. The central axis of the tubular core portion 21 is set at an angle to the bottom of the base 31 which corresponds to the angle which the axis of the projection 17 makes with the surface of the roof 19. As shown, the thickness of the base flange portion 31 tapers from a substantial thickness adjacent the core 21 to an edge 32 at its outer perimeter which is formed by the upper surface meeting the lower surface at an acute angle. In order to bridge any clearance gap between the base 31 and the roof structure 19, a sheet flashing material 33 is secured to the upper surface of the base 33 and extends past the edge 32 onto the upper surface of the roof structure 19. The sheet material may be elastomeric and cemented in place, or may be formed otherwise to assure a substantially water-tight joint between the base 31 and the roof 19. The roof 19 may include a roofing membrane 35 (not shown in FIG. 2) which overlies the flashing 33. Preferably, the roofing membrane has a cutout 34 to accommodate the pitch box so that the periphery of the cutout registers closely with the edge 32 of the base portion 31.

In order to facilitate manufacture of the pitch box and mounting of the pitch on the roof around the projection, the box 12 is preferably molded in complementary parts 12A and 12B. When engaged face to face, the two parts form the annular pitch box structure 12. Each part is provided with diametrically-opposite mating flanges or ears 36, 36 having apertures therein adapted to register to accommodate fasteners 37 which may be tightened and released to assemble and disassemble the pitch box in position around the vent pipe 17 prior to final installation. The plastic material of which the box is molded is weather-resistant when set, and is not subject to degradation due to exposure to sunlight, heat, cold, rain, snow, and the like.

When the pitch box 12 is assembled, and mounted in place, filler material 22 is positioned into the space between the vent pipe 17 and the tubular part 21 of the pitch box, and as shown in FIG. 4, is preferably poured in place and allowed to set. Roof mortar is a suitable filler material to use to anchor the pitch box in place around the vent pipe. Preferably, the anchoring material is filled to a level below the top of the tubular part 21 so as to expose the upper terminal edge of the tubular part in the space within the collar 23.

When the anchor material is in place, the space above the material 22 is filled with tar, pitch or another suitable pourable viscous waterproof material which sheds water and may adhere to the material of the pitch box and to the material of the vent pipe. Roofing tar is a suitable material and as shown in FIG. 4, the roofing tar 38 is mounded up above the top of the collar 23 to provide a run-off surface 39 extending downwardly from the vent pipe to the top of the collar 23. Thus, moisture which may accumulate by condensation or by precipitation on the vent pipe 17 may run down the pipe until it engages the surface 39 which then deflects the moisture to cause it to run to the outside of the collar 23 of the pitch box where it may run down and drip onto the flashing 33 and be dissipated on the roof surface.

In use, after a prolonged period of installation, it is not unlikely that the tar filler 38 may shrink and separate from the interior wall of the pitch box collar 23 allowing moisture running down the surface 39 to enter the space between the tar 38 and the collar 23. Any moisture entering this space will then enter the trough 25 and may travel down to the bottom of the trough to the weep holes 27 which afford discharge of the accumulated moisture through the weep holes onto the upper surface of the flashing 33 where it may then be dissipated over the roof. The upper terminal end of the tubular part 21 serves as a barrier against the moisture travelling into the interior of the tube 21 where it may adversely affect the anchor material 22 or the insulation 18.

It is preferable to fill the bottom of the trough with a closed-cell porous material 42 to facilitate the passage of any accumulated moisture within the trough outwardly through the weep holes. The use of a closed-cell material at the bottom of the trough assures gravity flow of moisture to the bottom of the trough where it may be discharged through the weep holes, and reduces the likelihood of moisture flowing up the tubular wall 21 by surface tension or capillary action and entering the clearance space between the pipe 17 and the tubular part 21. The material 42 also prevents clogging of the weep holes 27, so that the material 42 does not adversely affect the capability of the sealing material 38 to prevent leakage downwardly through the pitch box.

In order to enhance the protection of the anchor material 22 and the insulation 18, the parts 12A and 12B are preferably cemented together along their junction line and the base 31 is cemented and fastened with screws to the roof structure 19.

As is apparent from the foregoing description and the drawings, the present invention permits the vent pipe 17 to be sealed within the opening 16 regardless of the condition of its outer periphery. For example, if the vent pipe is of irregular outline, or has been dented or damaged, the anchor material 22 and the sealing material 38 accommodate to such irregularities to ensure against leakage between the vent pipe and the surrounding material.

Although a particular embodiment of the present invention has been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

What is claimed :

1. For constructing and repairing roofs, in combination with a roof having an opening and a projecting element penetrating into said opening, a pitch box for sealing the junction between said element and said opening comprising:

a tubular body surrounding said projecting element and said opening with clearance between the outer surface of said element and the inside surface of said tubular body;

said body having an upright axis and terminating at its lower end in a base bearing flush against said roof surface around said opening, and terminating at its upper end in a free marginal end portion; and

a collar surrounding said free marginal end portion in radially spaced relation thereto to provide an annular trough between said free marginal end portion of said body and said collar, said trough having a bottom wall means spaced above said base and below the upper end of said body, said wall means having a plurality of weep holes affording discharge of moisture from said trough through said weep holes, said collar extending above the level of said upper end of the tubular body so as to accommodate a waterproof sealant material extending

from the interior surface of said collar to the exterior surface of said projecting element above the upper end of said tubular body.

2. A pitch box combination according to claim 1 wherein said tubular body and said collar are square in cross section.

3. A pitch box combination according to claim 1 wherein said pitch box is separated along a plane including its upright axis into two parts, and including means to fasten said two parts together around said projection.

4. A pitch box combination according to claim 1 wherein said base comprises a flange portion projecting outwardly from said body at its lower end, said flange having a planar undersurface to bear flush against said roof surface, said flange tapering in thickness toward its outer perimeter, and terminating in an acute angular edge along said perimeter.

5. A roof assembly comprising a combination according to claim 1, including an anchoring material filling the clearance between the outer surface of said element and the inside surface of said tubular body, means overlying the bottom wall means of said trough to afford flow passages for moisture through said weep holes, and a sealant material overlying said anchor material and filling the space between the inside of the collar and the outside of said projecting element and being mounted up around the projecting element to provide a moisture-run-off surface directing moisture away from said projecting element toward said collar.

6. A roof assembly according to claim 5 wherein said base comprises a flange portion projecting outwardly from said body at its lower end and terminating in an edge about its periphery, the underside of said flange bearing flush against said roof surface, said assembly including flashing overlying the roof surface beyond said edge and overlying the flange about its periphery, and a roofing membrane having a cut-out conforming to the periphery of said flange and surrounding the same in a position overlying said flashing.

7. A roof assembly according to claim 5 wherein said means overlying said bottom wall means comprises a porous material filling the bottom of the trough, said sealant material overlying said porous material within said trough, said porous material causing said sealant material to be spaced above said weep holes.

8. A roof assembly according to claim 5 wherein said free marginal end portion of said tubular body extends a preselected distance above said bottom wall means, said porous material having a depth less than said preselected distance.

9. A roof assembly according to claim 8 wherein said anchor material comprises roof mortar partially filling the interior of said tubular member and extending from the roof opening upwardly to a level below the marginal end portion of said tubular body, whereby said sealant material encases said marginal end portion above said porous material on the outer surface and above said anchor material on the inner surface.

10. A pitch box comprising a molded structure formed of a plastic material which is weather resistant when set and is not subject to degradation due to exposure to sunlight, heat, cold, snow and the like, and said structure comprising an upright tubular body having a base at its bottom with a flange projecting outwardly therefrom, a bottom wall projecting outwardly from said tubular body above said base and flange and below the top of the tubular body and extending to its outer perimeter, and a collar extending upwardly from the outer perimeter of said bottom wall a distance to a height above the top of the tubular body, said bottom wall having perforations within said outer perimeter overlying said flange between said tubular body and said collar.

* * * * *

United States Patent [19]

Orth

[11] **Patent Number: 4,937,991**

[45] **Date of Patent: Jul. 3, 1990**

[54] **FLASHING UNIT FOR SEALING ROOF PENETRATIONS**

[76] Inventor: Michael J. Orth, 1375 NE. 134 St., N. Miami, Fla. 33161

[21] Appl. No.: 345,700

[22] Filed: May 1, 1989

[51] Int. Cl.[5] E04B 7/00

[52] U.S. Cl. 52/199; 52/60; 52/219; 285/42; 138/157

[58] Field of Search 52/60, 199, 219, 218, 52/574; 285/42; 98/42.22; 138/157

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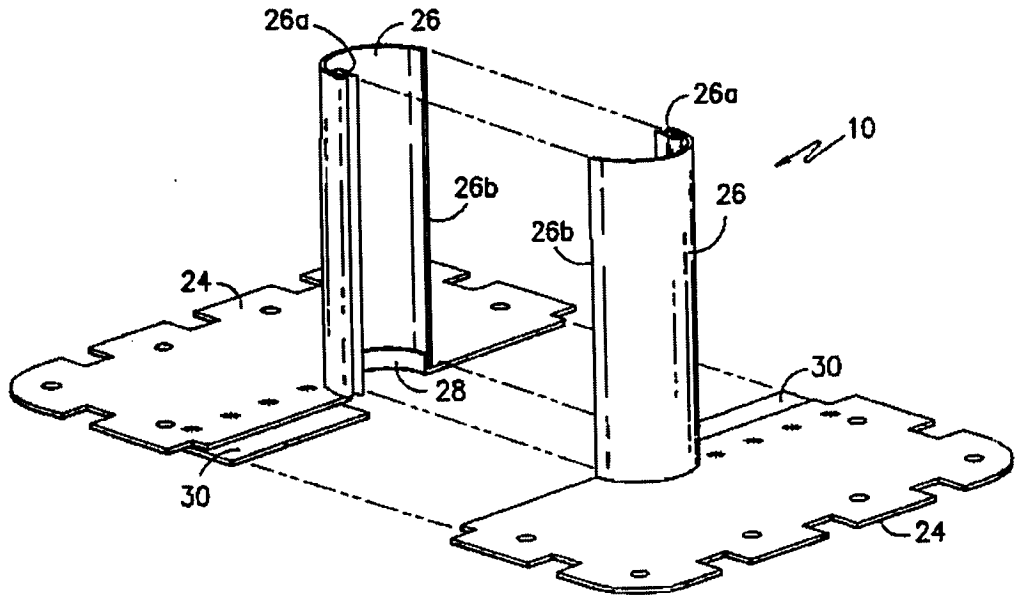
Primary Examiner—Carl D. Friedman
Assistant Examiner—Linda J. Hoffert

[57] **ABSTRACT**

An improved flashing unit for use in weatherproofing a roof penetration including complimentary mating half portions of generally regid, high-strength sheet material, each half portion comprising a base plate, a generally semi-cylindrical stack portion attached to and extending upwardly from the base plate, each base plate having an upwardly directed generally semi-cylindrical flanged edge disposed within the lower end of each semi-cylindrical stack portion, a longitudinal edge portion of each stack portion forming an elongated continuous channel for receipt of a corresponding smooth longitudinal edge of the opposite stack portion for snap-fit frictional retention of the two stack portions when mated with the edge portions of the base plates in abutment, lap plates attached to abutting edge portions of the base plates to be received in lapping relation with an abutting side edge portion of the opposing base plate, and a generally cylindrical counterflashing, or cap, for surrounding a roof penetration and receiving the upper end portion of the mated stack portions in radially inwardly spaced relation therefrom. The flashing unit may also serve as a roof vent.

7 Claims, 2 Drawing Sheets



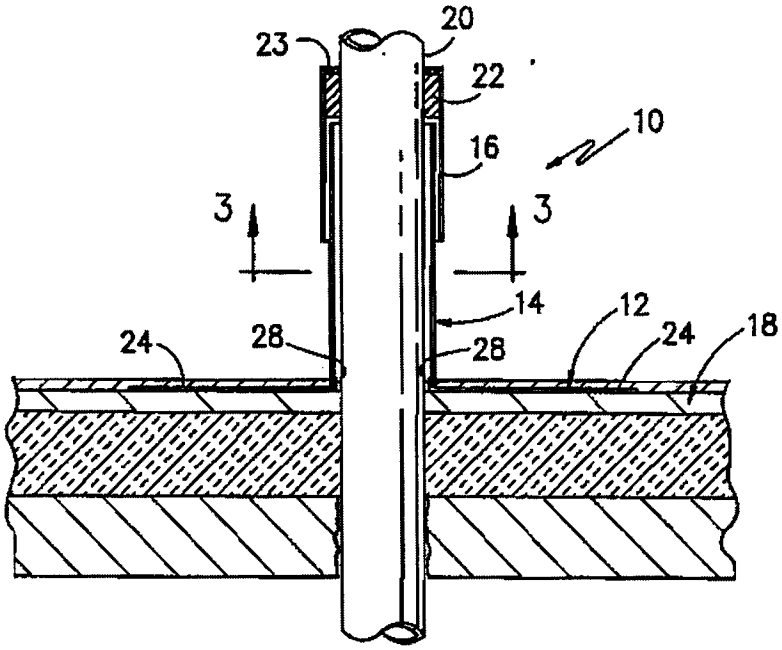

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FIG. —1—

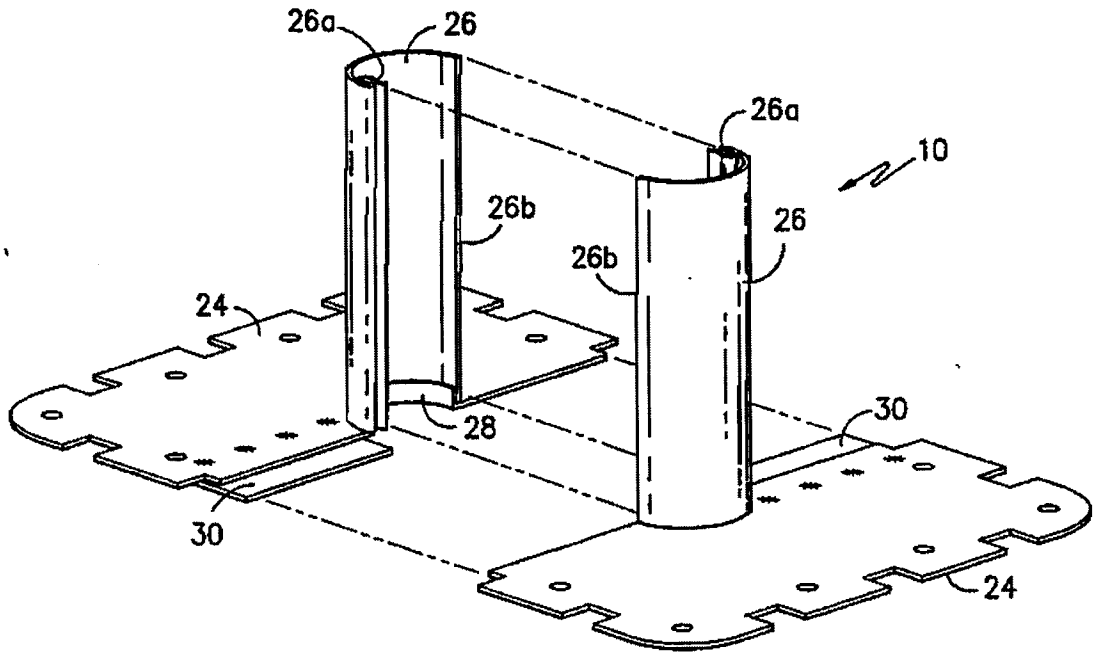
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FIG. —2—

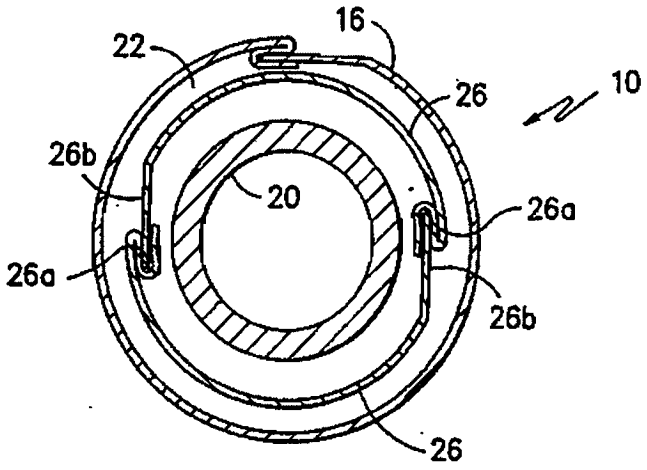

FIG. -3-

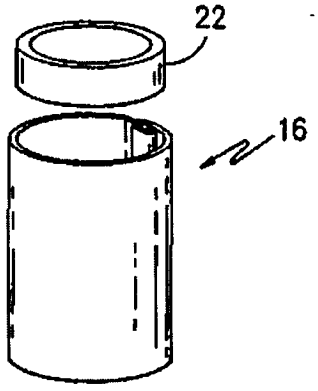

FIG. -4-

FLASHING UNIT FOR SEALING ROOF PENETRATIONS

The present invention is directed to a flashing unit for use to weatherproof pipes and other penetrations through a building roof, and, more particularly, to a flashing unit to weatherproof roof penetrations which may be mass-prefabricated at a manufacturing location, delivered to a construction site, and quickly and easily installed in a building construction by construction personnel.

BACKGROUND OF THE INVENTION

Flashing is widely employed in the building industry to weatherproof building roof constructions at their various juncture points with other components, such as vertical walls, and around roof penetrations, such as pipes, support beams, support rods, and the like, which extend through the roof.

Flashing for pipes and other roof penetrations typically are composed of thin sheet metal, which is cut and formed into the desired shape by construction workers at the building site, and fitted about the roof penetration to seal the opening of the roof between the penetration and the roof. For flat roofs, the flashing typically may consist of a base plate of sheet metal having a central opening. The base plate lies flat on and surrounds the opening in the roof. An upstanding, cylindrical hollow sleeve, or stack, surrounds the base plate opening, is secured thereto, and projects upwardly a distance above the roof line in surrounding relation to the pipe penetrating the roof. The stack is spaced outwardly from the pipe penetration a sufficient distance to permit relative movement between the penetration and roof construction. A cap, or counter flashing, is mounted in water-tight surrounding relation on the roof penetration, and overlies the upper end of the flashing stack to provide a weatherproof cover for the upper end of the stack.

Generally, in such sheet metal flashing constructions, the base plate is split to its central opening to facilitate its placement about the roof penetration, and the stack of the flashing is formed of a single flexible sheet of metal which is bent around the roof penetration into a cylindrical shape and soldered along its longitudinal seam to seal the same. The lower end of the stack is soldered to base plate and tabs located around its central opening. The counterflashing, or cap, of the flashing unit is generally a longitudinally split hollow sleeve of sheet metal of larger diameter than the stack, and is opened to encircle the protrusion and the upper end of the flashing stack. The counter flashing is secured to the roof penetration by suitable means, such as an internal gasket, sealant, and clamps.

In fabricating sheet metal flashings on site, even though architecturally specified, construction workers often may be inexperienced in properly sizing, cutting, and shaping the sheet metal stock material to the proper dimensions to effectively seal piping and other penetrations through the roof of the building. In addition, on-site flashing construction and fabrication results in increased labor and time for construction personnel.

It is also known to employ prefabricated flashing units made of a rigid plastic with an elastomeric covering material. One such prefabricated flashing unit is disclosed in U. S. Pat. No. 4,211,423, and consists of a multipart generally cylindrical unit with base flange and boot or cap of varying diameter stack, which may be height cut to provide a desired diameter to accommodate pipe of corresponding diameter. As disclosed in the patent, the roof seal device appears to be composed of multiple inner and outer sections which must be precisely aligned and secured with clamps and adhesively sealed at overlapping elastomeric portions resulting in what would appear to be a labor-intensive installation.

Prefabricated plastic flashings are also known which consist of a flexible longitudinally split generally cylindrical sleeve which is distorted to be brought around a roof penetration and thereafter secured along the split by screws and suitable clamping means.

It is generally believed that plastic and rubber flashing units have less resistance to UV light and weathering during use, and do not have the durability and use life of the sheet metal flashings.

BRIEF OBJECTS OF THE PRESENT INVENTION

It is an object of the present invention to provide an improved flashing unit to effectively weatherproof penetrations through building constructions, particularly pipe and other penetrations through the roof of a building.

It is another object to provide an improved flashing unit for weatherproofing penetrations through building roofs which also serves as a roof vent for air passage therethrough.

It is a further object to provide a flashing unit of relatively simplified construction which may be mass prefabricated at an off-site manufacturing location, economically delivered, and easily and quickly installed by construction personnel to weatherproof openings around roof penetrations of a building.

It is a more specific object to provide an improved light-weight, sheet metal flashing unit which may be prefabricated at an off-site location, and readily snap-fit installed around existing roof penetrations, such as pipes, by construction personnel to effectively weatherproof the roof openings around the same.

BRIEF DESCRIPTION OF THE DRAWINGS

The above, as well as other objects of the present invention, will become more apparent, and the invention will be better understood, from a detailed description of preferred embodiments thereof, when taken together with accompanying drawings, in which:

FIG. 1 is a sectional elevation view of an improved flashing unit of the present invention, showing it in relation to its installation in a roof construction to weatherproof a penetration therethrough;

FIG. 2 is an enlarged exploded perspective view of the base plate and stack portions of the flashing unit of FIG. 1, showing the component parts thereof in separated relation to better illustrate the construction and assembly of the component parts thereof;

FIG. 3 an enlarged horizontal cross-sectional view of a portion of the stack of the unit, taken generally along line III—III of FIG. 1, and looking in the direction of the arrows; and

FIG. 4 an exploded view of counterflashing employed as a cap for the stack of the flashing unit of FIG. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring more particularly to the drawings, the improved flashing unit 10 of the present invention employed for sealing penetrations through building constructions, particularly pipe and other protrusions through the flat roof of a building, generally includes a support base 12 of generally rectangular, e.g., square, shape having radial corners, an up-standing stack 14, and a counter flashing, or cap, 16. As seen in FIG. 1, the support base 12 is placed in supporting contact on a horizontal surface portion of a roof structure 18 to which the flashing is to be attached, and the stack 14 surrounds a roof protrusion, or pipe 20, in spaced relation thereto, to permit relative movement between the pipe 20 and the roof structure 18. Surrounding an upper portion of the pipe 20, and sealingly secured thereto by a suitable flexible gasket 22 and sealing material 23, is the short, cylindrical counterflashing, or cap 16, which has an internal diameter greater than the external diameter of the stack 14. The lower end of cap 16 surrounds the upper end of stack 14 in radially outward spaced relation therefrom and provides a weatherproof cover to prevent rain water and other material from falling into the open space between the interior diameter of the stack 14 and the outer diameter of the pipe 20.

As best shown in FIG. 2, the flashing unit of the present invention, in its pre-installed configuration, includes two prefabricated complementary halves, each comprising a base plate portion 24 and a generally semi-cylindrical up-standing stack portion 26, formed of a suitable material, preferably a thin sheet of stainless steel.

The base plate portions 24 are provided with a central semi-circular edge portion along their opposed side edges. Each semi-circular edge has an up-turned, short, semi-cylindrical flanged edge 28 which may be suitably formed thereon, as by metal deforming of the base plate. Preferably, the flange of the two base plate halves may be formed by mandrel deformation of an opening through a single sheet of metal, which is then cut to form the two base plate halves.

Each semi-cylindrical stack portion 26 of the unit surrounds and is attached to the base plate portion 24 and its up-standing flange 28, as by spot-welding in the prefabricating operation. As seen in FIGS. 2 and 3, one full longitudinal edge of each semi-cylindrical stack portion 26 is bent by suitable sheet metal shaping equipment to form an elongated channel 26*a* for frictional receipt of an opposite, straight longitudinal edge 26*b* of the opposing stack portion when the two halves of the unit are snap-fit together to surround a roof penetration, e.g., pipe 20, at the building site location. The two halves of the stack are thus effectively secured together along their opposite longitudinal side edges, when the unit is installed.

Referring to FIG. 2, the abutting edges of the base plate portions 24 are provided with lap plate sections 30. As shown, one side edge portion of the abutting edges of each base plate portion 24 is provided with a short lap plate 30 which may be spot-welded to the underside of the base plate portions, so that the two lap plates 30 underlap the opposing side edge of the opposite base plate portion when the two halves of the unit are installed about the roof projection.

As best seen in FIG. 4, the counterflashing 24 for the unit of the present invention may be composed of a suitable material, such as thin sheet metal which is formed with a longitudinal channel along one side edge, rolled into a hollow cylinder and secured along its edges, as by soldering or the like. Gasket 22 of suitable material, such as a self-adhering, 1" wide closed cell foam, may be placed on the pipe 20¼" to 3/16" above the top of stack 14 and the counterflashing, or cap 16, located therearound. The top of the counterflashing 16 is located approximately ¼" to 3/7" above the top edge of the gasket to form an open top pocket into which a sealant material 23, such as a gunable grade single part urethane sealant, may be applied in on-site installation. As seen in FIG. 1, the unit, when installed, is placed in closely surrounding relation with a roof opening on the roof support surface, with the counterflashing 16 being secured in sealing engagement directly to a penetration through the roof.

The prefabricated half sections of the present invention may be readily snap-fit around roof protrusions during installation, without the need for bending or deforming the halves of the base plate or stack during installation. It can be appreciated that the base plate may be of substantial horizontal dimension to insure full cover of the roof for a considerable distance away from the roof opening through which the penetration extends, thereby providing improved weatherproof seal and structural support of the stack of the unit on the roof support of the building.

Typically, the prefabricated flashing unit of the present invention may be readily assembled at a central off-site manufacturing location, with the semi-cylindrical stack portions 14 spot-welded to their respective base plate flange portions 28, thus providing a base and stack of two-piece prefabricated construction. The counterflashing 16 may be formed of a single split-cylinder of sheet metal, opened to surround the upper portion of the stack and roof protrusion, and thereafter soldered or sealed at the juncture of the edges of the cap 16. The longitudinal seams and the bottom edges of the stack portions 14 may be soldered after assembly on site to seal the seams and the bottom edges to the base plates. The sheet metal base plates may be coated or laminated with a suitable material or substance compatible with the applied roof membrane surface or composition to facilitate seal of the same thereto, e.g., polyvinyl chloride.

Another important feature of the flashing unit construction of the present invention is that it may serve as a roof vent, as well as weatherproof a roof penetration of a building. As seen in FIG. 1, the counterflashing or cap 16 of the flashing unit surrounds the upper portion of stack 14 radially outward and vertically upward spaced relation of the stack to provide a passageway for air flow and venting of the roof, allowing moisture from the roof substrate to vent between the stack and the counterflashing. This construction effectively reduces the number of conventional roof vents which otherwise might be required for the building.

As can be appreciated, the size of the flashing units of the present invention will vary in diameter to accommodate the particular size roof penetrations to be sealed. A typical prefabrication may be formed with a cylindrical stack about 9" high. The base plate and flange portions may be formed by cutting a hole in the center of a single piece of sheet metal ¼" smaller than the stack diameter and extruding the peripheral edges of the hole ¼" upward at a 90° angle to match the internal diameter of the stack. The sheet is then cut into equal

halves to form the two portions 24. The base plates preferably are dimensioned to extend horizontally at least about 4" from the stack in all directions with 1½" radial corners. The counterflashing, or cap, is preferably a minimum of 5" high with about 3¾" overlap of the stack flashing. The stack may be sized to fit individual pipe or other roof penetrations with a ¾" minimum clearance in any direction for movement. The flashing sheet material preferably is formed of stainless steel, such as a Type 304-2B-26 gauge (0.018 in.) ASTM A167, Fed. Spec. QQ-S-766.

Although it is preferred that the flashing unit of the present invention be constructed of a durable, thin, sheet metal material, such as stainless steel, it may be constructed of a suitable rigid high-strength plastic.

That which is claimed is:

1. An improved prefabricated flashing unit for use in weatherproofing roof penetrations including a pair of complementary mating half portions of generally rigid, high-strength sheet material, each half portion comprising a base plate and generally semi-cylindrical stack portion attached to and extending upwardly from an edge portion of each base plate, each base plate having an upwardly directed generally semi-cylindrical flanged edge disposed within the lower end of each semi-cylindrical stack portion in engagement with the lower edge portion of the stack portion, means securing each stack portion to its base plate, one longitudinal edge portion of each stack portion forming an elongated continuous channel for receipt of the corresponding smooth longitudinal edge of the opposite stack portion to provide snap-fit frictional retention of the two stack portions when mated with the edge portions of the base plates in abutment, and means operatively attached to the abutting edges of the base plates to lap the same and facilitate seal and strength of the unit when in mating relation.

2. A flashing unit as defined in claim 1 wherein said operatively attached means comprises a lap plate attached to an abutting edge portion of each base plate on one side so as to be received in lapped relation with the other abutting side edge portion of the opposing base plate.

3. A flashing unit as defined in claim 1 further including a counterflashing of generally hollow cylindrical shape having a longitudinal split therealong, one longitudinal edge of the split forming a continuous channel for receipt of the other longitudinal edge of the counterflashing in frictional engagement therewith, the counterflashing being dimensioned so as to receive the upper end of the assembled stack portions in radially inward spaced relation therefrom, and sealing means for securing and sealing the upper end portion of the counterflashing to a roof protrusion extending therethrough.

4. A flashing unit as defined in claim 1 wherein the base plate and stack portions are formed of a thin, rigid, high-strength metal, and the semi-cylindrical stacks of each half portion are secured to their base plate by welding.

5. A flashing unit as defined in claim 1 wherein each base plate is of generally rectangular configuration and extends for at least about 4" radially outwardly of the stack portion.

6. A flashing unit as defined in claim 1 comprising means on each base plate to facilitate securement of the base plate to a roof construction.

7. A flashing unit as defined in claim 1 further including a counterflashing of generally hollow cylindrical shape for surrounding, in sealing engagement, a penetration of a building roof, said counterflashing being dimensioned to receive the upper end of a portion of the assembled stack portions in radially outward and vertically upward spaced relation therefrom to provide a passageway for venting a roof opening about which the unit is placed.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,937,991
DATED : July 3, 1990
INVENTOR(S) : Michael J. Orth

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Abstract, line 3, "regid" should be -- rigid --.

In the Specification:

Column 2, line 64, "111—111" should be -- 3—3 --.

Column 4, line 9, "3/7"" should be -- 3/16" --.

Signed and Sealed this

Tenth Day of December, 1991

Attest:

HARRY F. MANBECK, JR.

Attesting Officer

Commissioner of Patents and Trademarks

ALP00392

United States Patent [19]

Evensen

[11] **Patent Number: 5,067,291**

[45] **Date of Patent: Nov. 26, 1991**

[54] **PASS-THROUGH ROOF SEAL SYSTEM**

[76] Inventor: **Laurence P. Evensen**, 7711 Millwood Ave., Canoga Park, Calif. 91304

[21] Appl. No.: 534,989

[22] Filed: Jun. 8, 1990

[51] Int. Cl.[5] E04D 13/14

[52] U.S. Cl. 52/219; 52/199; 52/218; 285/42

[58] Field of Search 52/219, 218, 198, 199; 285/42, 43, 44

[56] **References Cited**

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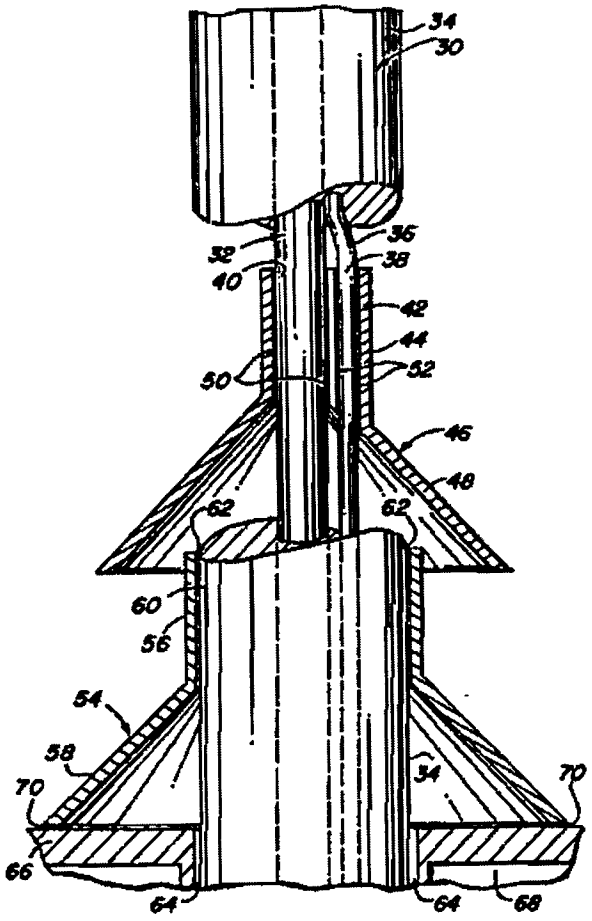
Primary Examiner—Michael Safavi

Attorney, Agent, or Firm—John J. Posta, Jr.

[57] **ABSTRACT**

The pass-through roof pipe seal system includes an adapter in the form of an inverted funnel with a vertical upper tube and integral lower flared skirt defining a central cavity through which a coolant pipe from a roof air-conditioning unit or the like passes. The pipe has an external layer of insulation around it except for a cut-away portion in the area of the funnel tube, which tube adheres directly and sealingly to the coolant pipe itself to prevent moisture from penetrating the system. The funnel skirt flares out over the lower edge of the cut-away portion of the invention and thus protects it from moisture and also overlies an inverted funnel-shaped vent cup having an upper vertical tube and lower skirt. The vent cup tube is adhered to the outside of the insulation layer around the coolant pipe below the adapter and is protected by the adapter skirt. The vent cup overlies the roof hole of a building upon which an air-conditioning unit is installed and prevents moisture from entering the building. The system is simple, durable and efficient.

5 Claims, 1 Drawing Sheet



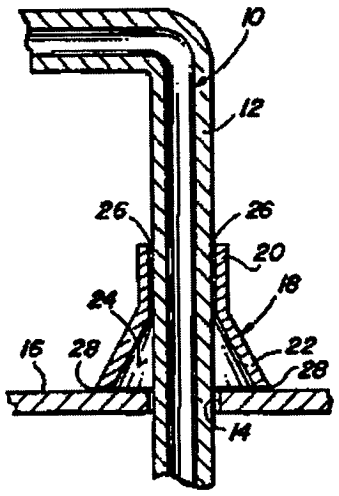


FIG. 1
(PRIOR ART)

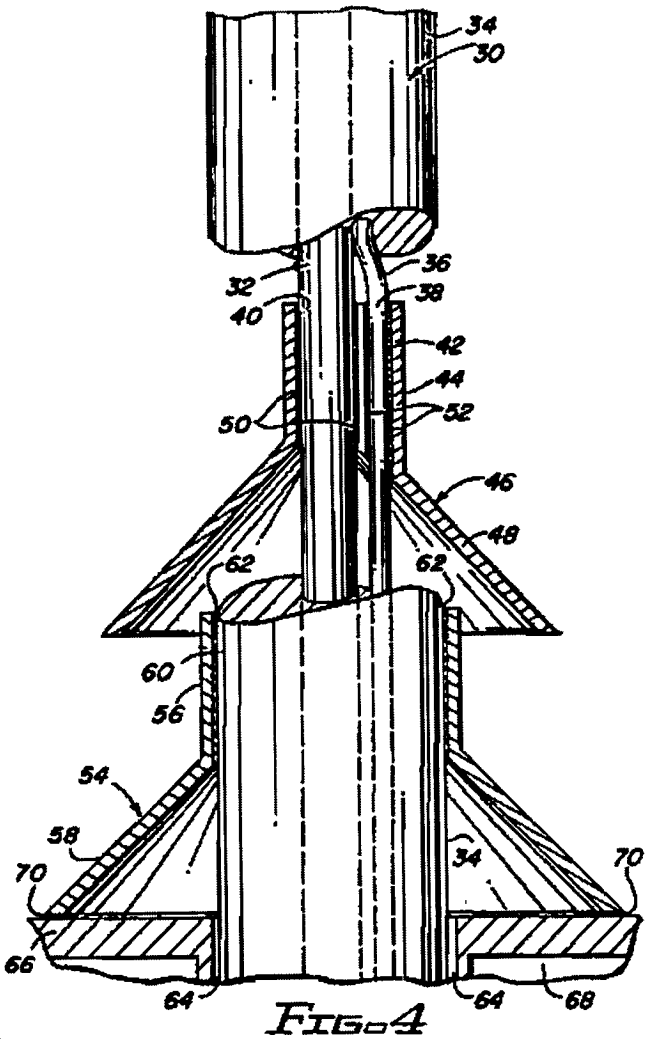


FIG. 4

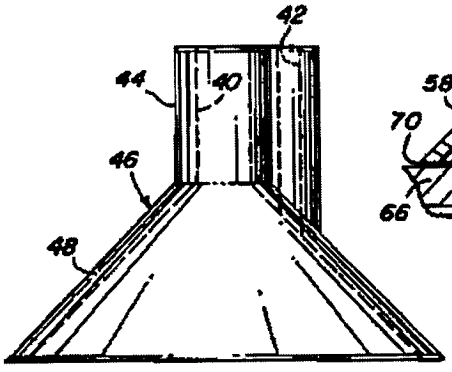


FIG. 2

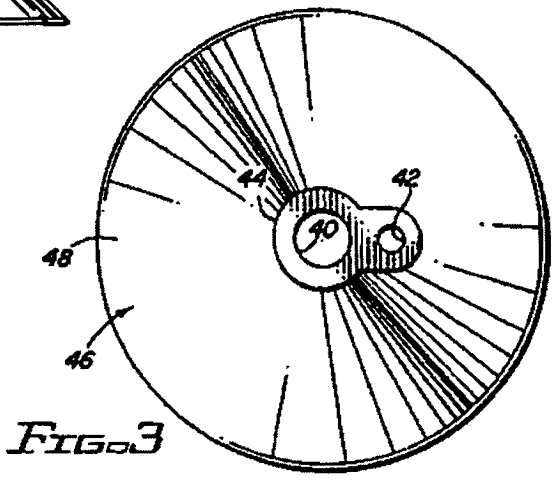


FIG. 3

PASS-THROUGH ROOF SEAL SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to seals and more particularly to an improved roof pipe sealing system.

2. Prior Art

Air-conditioning units for buildings are frequently placed on the roof, with coolant pipes passing through the roof to and from the air-conditioning units. Many types of roof pipe seals have been devised for this and other similar situations. See, for example, U.S. Pat. Nos. 4,280,305 for roof flashing for solar collectors, U.S. Pat. No. 4,211,423 for a generally conical flashing unit and U.S. Pat. No. 3,871,145 for flashing for a pitch pocket. Most commonly used is an inverted funnel-shaped vent cup, the upper tube portion of which is adhesively connected to the outside of the insulation layer around a coolant pipe or the like. The problem with such a device is breaking of the moisture seal with the insulation layer as the insulation and/or adhesive deteriorates due to weathering. Once this seal is broken, moisture can penetrate the insulation and run down the exterior of the pipe, through the roof hole which is covered by the vent cup and into the building, ruining the interior of the building. There remains a need for a simple, durable and inexpensive system to overcome this problem and thus prevent moisture penetration through roof pipe holes.

SUMMARY OF THE INVENTION

The improved pass-through roof pipe seal system of the present invention satisfies all the foregoing needs. The system is substantially as set forth in the Abstract of the Disclosure. Thus, it includes an upper adapter in the form of an inverted funnel with an upper vertical tube and an integral lower flared skirt defining a central cavity through which a coolant pipe passes from a roof air-conditioning unit or the like. The pipe has an external layer of insulation around it except in a cut-away portion in the area of the adapter funnel tube, which tube is permanently bonded directly to the pipe to prevent moisture from penetrating the system.

The funnel flares out to overlie the lower edge of the cut-away portion of pipe insulation and thus protects it from moisture penetration. It also overlies an inverted funnel-shaped vent cup having an upper cup tube and a lower flared cup skirt. The cup tube is bonded to the exterior of the insulation layer around the coolant pipe below the adapter and is protected by the adapter skirt.

The vent cup overlies the roof of a building upon which an air-conditioning unit employing the pipe is installed and prevents moisture from entering through a pipe hole in the roof which the cup covers. The system is simple, durable and inexpensive, as well as being efficient in preventing passage of moisture into the building upon which it is mounted. Further advantages of the system are set forth in the following detailed description and accompanying drawings.

DRAWINGS

FIG. 1 is a schematic vertical cross-section of a conventional prior art roof pipe seal vent cup in place on a roof;

FIG. 2 is a schematic side elevation of a preferred embodiment of the roof seal adapter of the present system;

FIG. 3 is a schematic top plan view of the adapter of FIG. 2; and,

FIG. 4 is a schematic side elevation, partly in section, of a preferred embodiment of the present system, employing the adapter of FIGS. 2 & 3, along with a vent cup.

DETAILED DESCRIPTION

FIG. 1

Referring more particularly to FIG. 1 of the drawings, a prior art vent cup for an air-conditioning roof pipe is shown in sealing engagement with the insulated layer around the pipe and positioned to cover a roof pipe hole.

Thus, an air-conditioning unit roof pipe 10 is shown which has an insulated external layer 12 therearound. Pipe 10 extends vertically down through an opening 14 in roof 16 into a building (not shown) covered by roof 16. An inverted funnel-shaped vent cup 18 comprises an upper narrow tubular portion 20 and a lower depending integral skirt 22 defining therewith a central space 24. Portion 20 is sealed, as by adhesive layer 26, directly to the outside of insulative layer 12 and the bottom of skirt 22 may be sealed, as by an adhesive layer 28 to roof 16. When layer 12 or 26 breaks down due to weathering where adhesive layer 26 is applied to layer 12, moisture can penetrate into space 24 and migrate freely through hole 14 into the building coverfed by roof 16, defeating the purpose of vent cup 18, and causing damage to the interior of such building.

FIGS. 2, 3 and 4

The improved system of FIGS. 2, 3 & 4 prevents moisture from penetrating through the roof of a building upon which the system is mounted. Thus, system 30 (FIG. 4) is shown which comprises a coolant roof pipe or other roof pipe 32 bearing an external insulated layer 34, except in a cut-away portion 36. In system 30, a second smaller return pipe 38 may be disposed also within insulated layer 34. Pipes 32 and 38 pass vertically down through openings 40 & 42 (FIGS. 3 & 4) in the upper tubular portion 44 of adapter 46 which is in the form of an inverted funnel, having an integral lower flared skirt 48. It will be noted that tube 44 is directly and permanently sealed against moisture to pipes 32 and 38, as by adhesive layers 50 & 52, respectively. Adapter 46 may be split into two equal hinged halves together, or two integral halves, soldered or otherwise secured in place around pipes 32 and 38 (FIG. 3).

Skirt 48 overlies and moisture protects the lower edge of cut-away portion 36 against ingress of moisture. Below that cut-away portion 36, an inverted funnel-shaped vent cup 54 is provided having an upper vertical tube 56 and integral lower flared skirt 58. Tube 56 may be split into two equal hinged or unhinged halves, subsequently soldered or otherwise secured around pipes 32 & 38. Tube 56 has a central opening 60 down through which pipes 32 & 38 fully insulated with layer 34 pass, being sealed thereto by adhesive layer 62 against layer 34. Pipes 32 & 38 pass down through an opening 62 in roof 64 into a roofed building 66.

The lower end of skirt 58 may be sealed, as by adhesive layer 70, directly to roof 66, or otherwise attached thereto (e.g., nails, not shown). Skirt 48 protects system

30 against moisture penetration if adhesive layer 62 separates from insulated layer 34 in tube 56, because skirt 48 physically overlies or covers this part of system 30. Accordingly, system 30 remains moisture proof and prevents moisture from passing into building 68 through opening 64.

One or more of pipes 32 & 38, adapter 46 and vent cup 54 may be metal, plastic, rubber, ceramic, etc., or mixtures thereof, as desired, for durability and functionality. It will be understood that adapter 46 and vent cup 54 can be any suitable size and proportions.

Various other modifications, changes, alterations and additions can be made in the improved system of the present invention, its components and parameters. All such modifications, changes, alterations and additions as are within the scope of the appended claims form part of the present invention.

What is claimed is:

1. An improved pass-through roof pipe seal system, said system comprising, in combination:

a) an adapter comprising an inverted funnel having an upstanding vertical upper tube and an integral lower skirt flaring downwardly and outwardly therefrom, said tube and skirt defining a central cavity;

b) an air-conditioning coolant pipe assembly comprising an external, flexible insulated jacket disposed around a pipe, said assembly including a vertical pipe portion from which said jacket has ben cut-away to form a cut-away pipe portion, which pipe portion passes down through said adapter cavity and wherein said pipe is directly sealed to said tube, said skirt covering the lower edge of said cut-away pipe portion for maximum moisture protection;

c) an inverted funnel-shaped vent cup having an upper vertical tube and lower skirt, said cup being secured directly to the outside of said jacket below said adapter, such that said cup is displaced from said coolant pipe by said insulated jacket; and

d) wherein said adapter funnel tube has a pair of spaced vertical openings parallel to each other and extending down to said skirt, wherein said coolant pipe assembly includes a return pipe parallel to said coolant pipe, and wherein said pipes are disposed in and sealed directly to said openings in said tube.

2. The improved system of claim 1 wherein said vent cup tube is below said adapter skirt.

3. An adapter for preventing moisture from passing through a roof having an opening therein and having a pipe with insulation thereon pass through said opening, and also having a vent cup which includes a vertical tube disposed about said pipe and insulation and secured to said insulation, comprising,

a) an inverted funnel portion having an upper vertical tube section and a lower downwardly and outwardly extending skirt portion,

b) said tube section having an opening therein with an inner diameter which is substantially identical to the outside diameter of said pipe,

c) wherein said tube section is secured directly to said pipe,

d) wherein said roof has an opening therein adapted to have a plurality of pipes with insulation thereon pass therethrough,

e) wherein said tube section has a plurality of openings therein which have inner diameters corresponding, respectively, to substantially the outside diameters of said plurality of pipes, and

f) wherein said tube section is secured directly to said plurality of pipes.

4. The adapted of claim 3 which is comprised of two substantially equal unhinged parts adapted to be mated and secured together.

5. The adapter of claim 3 which is comprised of two substantially equal hinged parts adapted to be mated and secured together.

* * * * *

US005176408A

United States Patent [19]

Pedersen

[11] Patent Number: 5,176,408

[45] Date of Patent: Jan. 5, 1993

[54] SEAL DEVICE FOR PIPES PASSING THROUGH ROOF STRUCTURES

[76] Inventor: Raymond J. Pedersen, 12 Fallons Way, Bayswater, Victoria 3153, Australia

[21] Appl. No.: 632,617

[22] Filed: Dec. 26, 1990

Related U.S. Application Data

[63] Continuation of Ser. No. 328,223, Feb. 27, 1989, abandoned.

[30] Foreign Application Priority Data

Jan. 4, 1987 [AU] Australia PI2345

[51] Int. Cl.[5] F16L 5/00

[52] U.S. Cl. 285/42; 285/43; 285/44; 285/419

[58] Field of Search ..... 285/42, 43, 44, 419; 24/136 R

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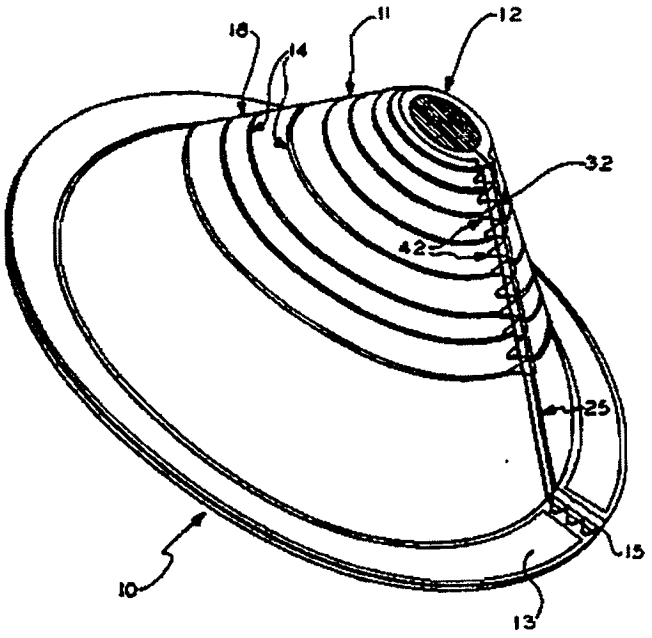
0003323	6/1987	PCT Int'l Appl. .

Primary Examiner—Randolph A. Reese
Assistant Examiner—Timothy Aberle
Attorney, Agent, or Firm—Ribis, Graham & Curtin

[57] ABSTRACT

A seal device for providing a weather seal between an elongated member such as a pipe, and a surface, such as a roof of a building, through which the pipe extends. The seal device has an apertured base member of resilient material with one end in contact with the roof and the opposite end with an aperture through which the pipe extends. The base member has a sleeve of resilient material integral and projecting from one surface thereof and includes the aperture on the opposite end of the sleeve. A rib formed integral with the sleeve and base member projecting outwardly from the external surface thereof. The rib extends generally down the length of the sleeve and across the base member whereby in use the wall of the sleeve and base member may be slit adjacent to and for the full length of the rib to permit opening of the sleeve and base member to allow fitting around the pipe. The rib has clamp means for holding it closed.

21 Claims, 4 Drawing Sheets



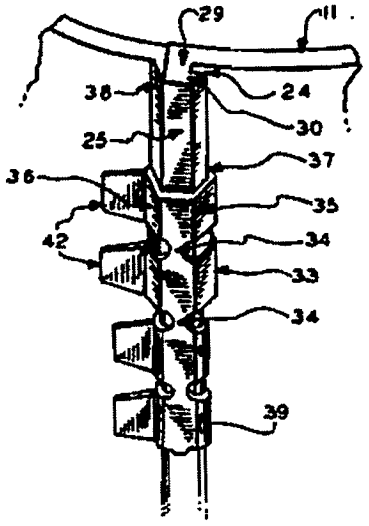


FIG. 1

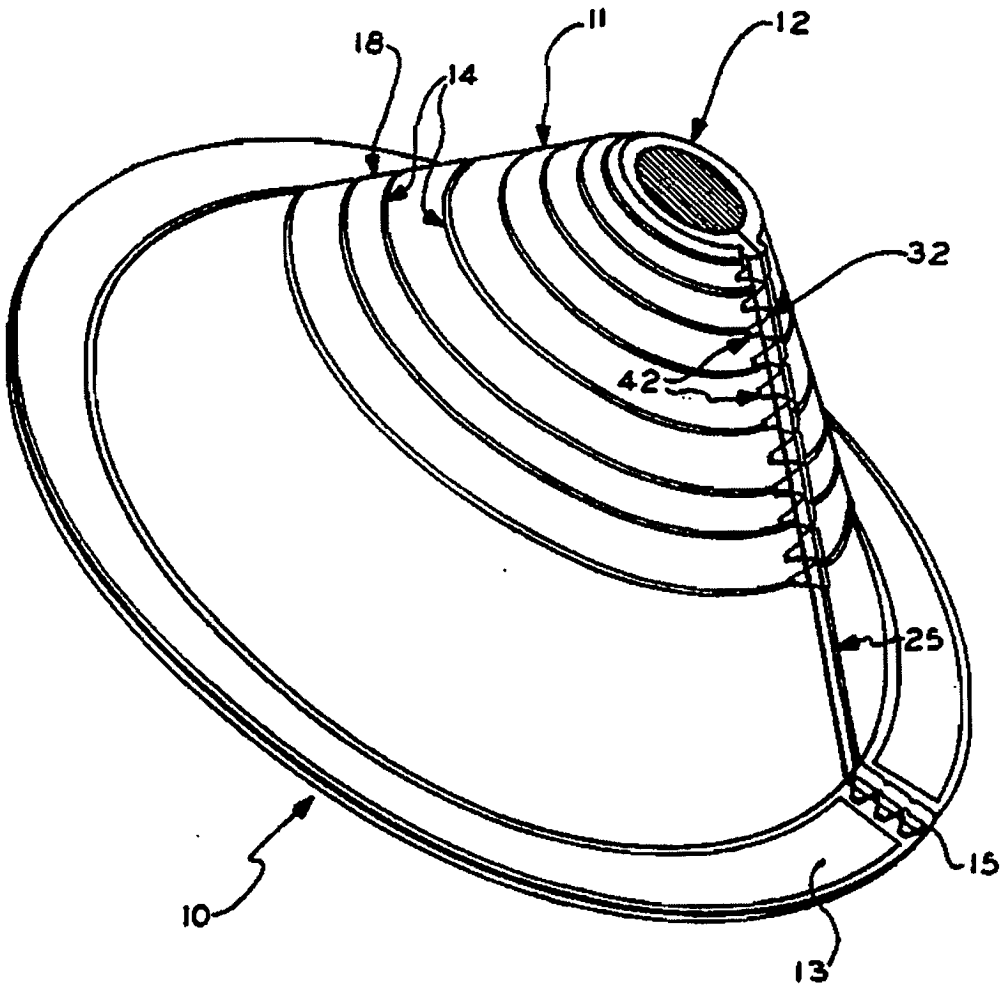


FIG. 2

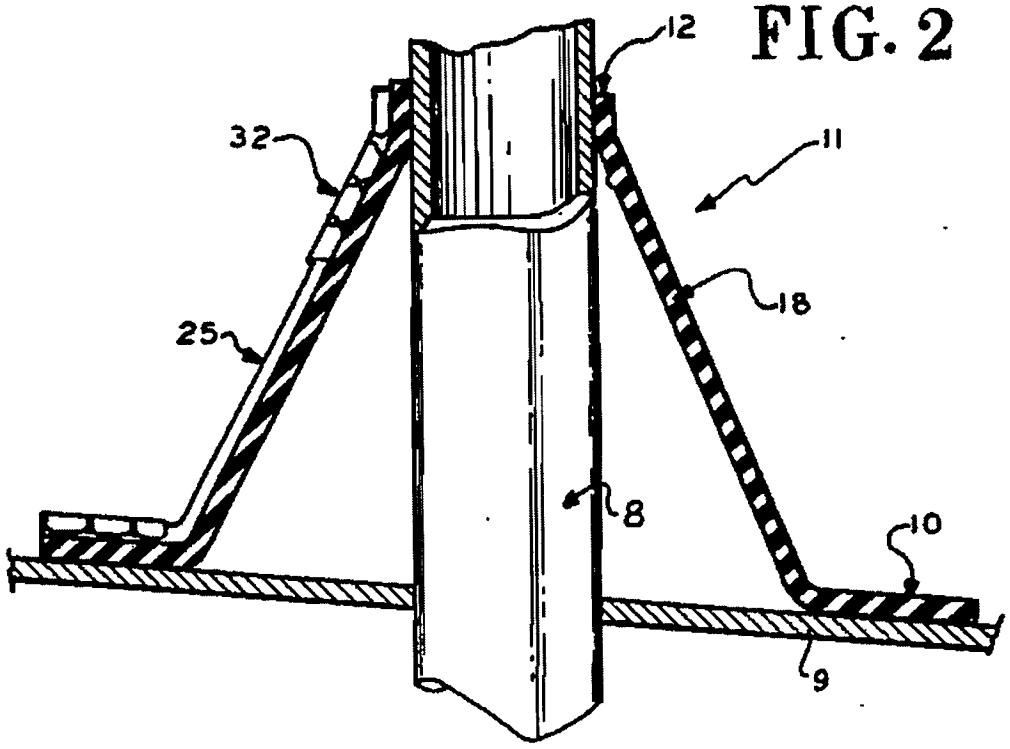


FIG. 3

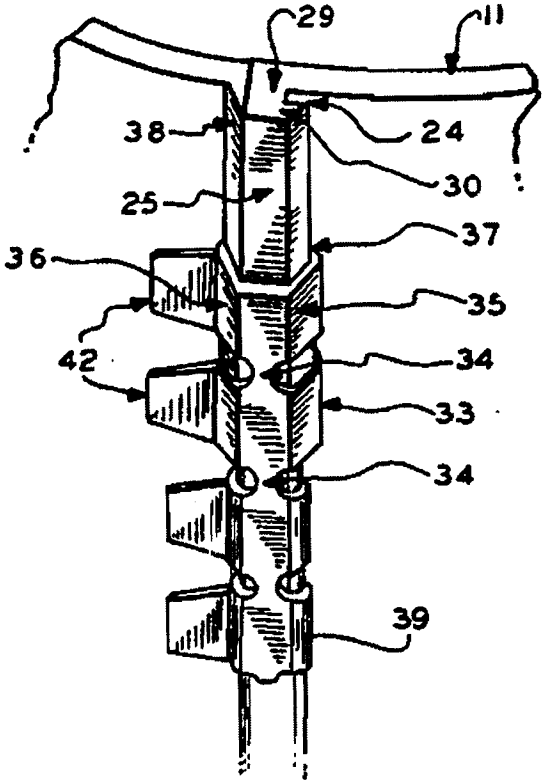


FIG. 4

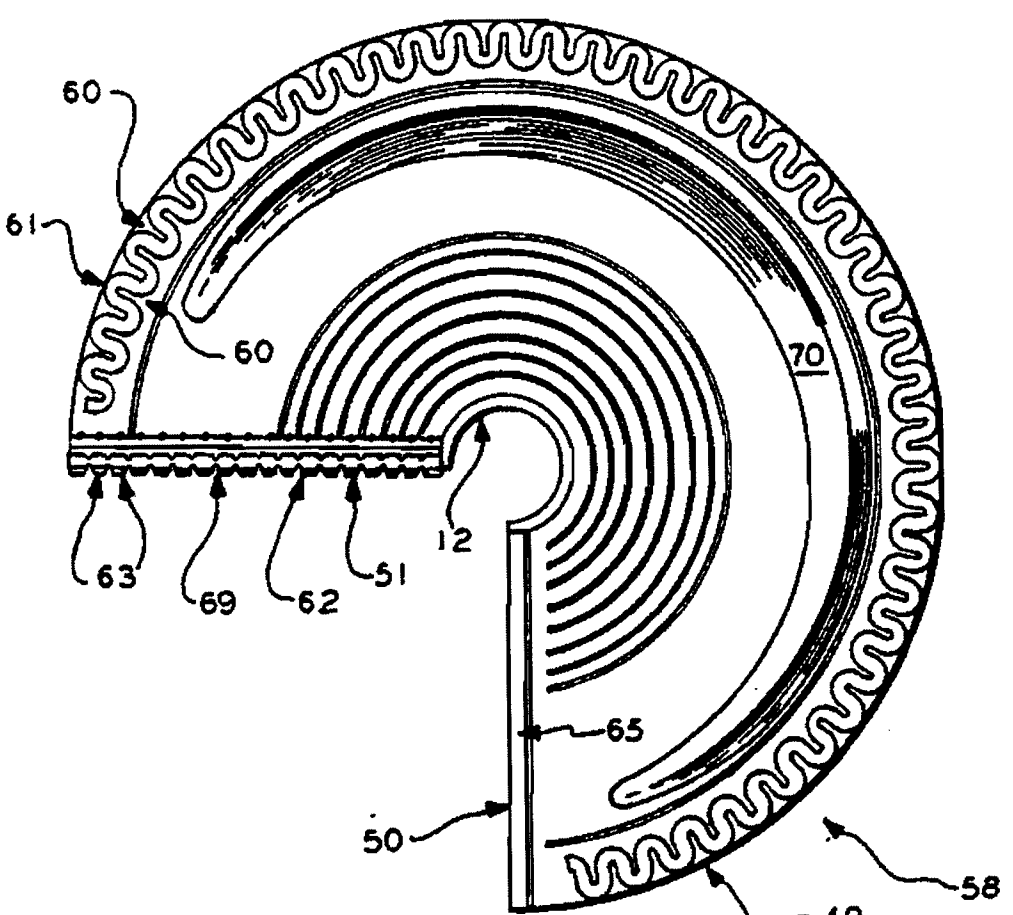


FIG. 5

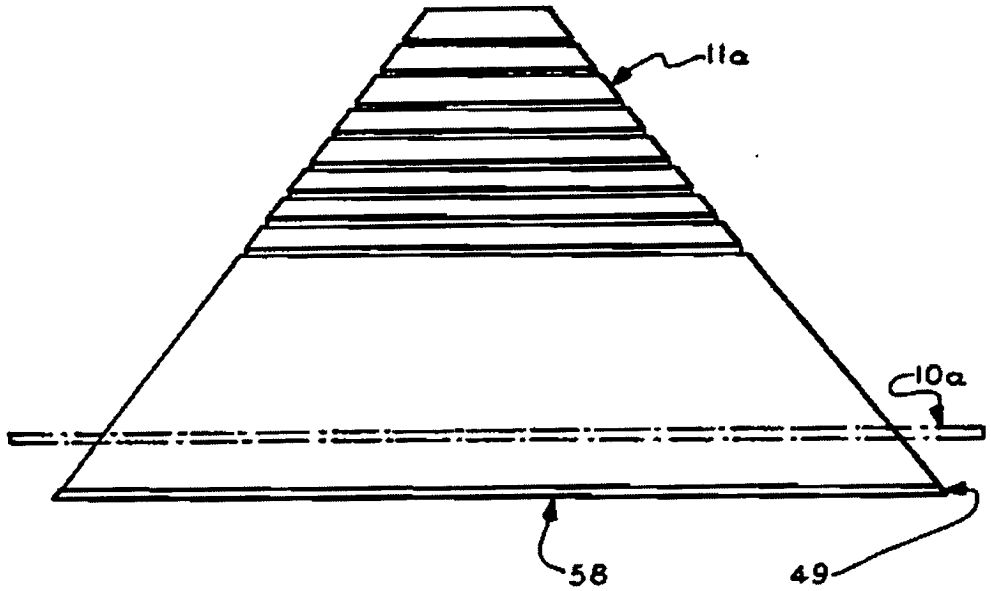
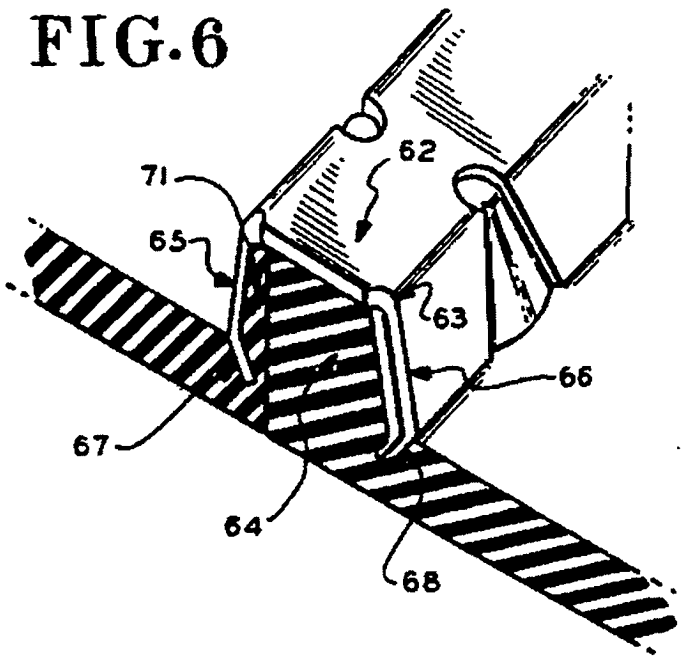


FIG. 6



SEAL DEVICE FOR PIPES PASSING THROUGH ROOF STRUCTURES

This application is a continuation of application Ser. No. 328,223, filed Feb. 27, 1989, now abandoned.

This invention relates to an improved seal device for providing a weather seal between an elongate member and a non-planar surface, such as a roof or wall of a building of like structure.

There are currently in use in Australia seal devices for this purpose comprising an apertured base member including a non-metallic apertured flange element of resilient material bonded in face-to-face relation to a peripheral or part peripheral manually deformable non-resilient metallic flange, and a sleeve member of resilient material integral with the base member and extending upwardly therefrom to receive the elongate member. The base member is in use secured to the non-planar roof or wall and, being of a non-resilient manually deformable nature may, in use, be deformed to conform to the contour of the non-planar surface and will substantially retain such deformed contour. The sleeve member has an end remote from the base member which is adapted to receive said elongate member in sealing engagement therewith when the seal device is in use. The sleeve member, between the said remote end thereof and the base member, is preferably sufficiently flexible to accommodate in use misalignment between the base member and the remote end of the sleeve, that may arise during installation or during the service life of the seal device.

One form of a seal device of the general construction as above referred to is described in more detail in U.S. Pat. No. 4,333,660 issued to Cupit in June 1982. That seal device is very effective when used for pipes or ducts of a size up to about 400 mm diameter or similarly sized rectangular ducts. However, in many applications, as encountered in industrial and commercial building, it is required to seal about large pipes and ducts, as used in ventilation and air conditioning systems, and a modification of the seal device, above referred to, for use on large pipes is disclosed in U.S. Pat. No. 4,664,390 issued May 12, 1987 to David G. Houseman.

Both of the above referred to known constructions require the seal device to be assembled to the elongated member by inserting one end of the member through the sleeve member of the seal device, and then passing the seal device along the elongated member until it comes into the required location relative to the roof or wall structure. This mode of assembly requires the absence of the components on the elongated member or parts thereof protruding beyond the outside surface of the elongate member, which would interfere with the movement of the sleeve of the seal device along the elongate member.

During the initial construction, it is normally possible to arrange the fitment of the seal device to the elongate member before other components, which would interfere with the fitment of the seal device, are attached thereto. However, in situations where it is not possible to insert the end of the elongate member through the sleeve and move the seal device into its required position, seal devices of the above discussed construction cannot be employed. Also it is frequently necessary to provide a replacement seal about an elongate member which is coupled to equipment or has a weather cover or structural stays attached thereto, which preclude the sliding of the sleeve portion of the seal device along the elongate member.

It is therefore the principal object of the present invention to provide an effective weather seal device for use on elongate members that extend through roofs or like surfaces, that is capable of being installed whilst the elongate member is in situ extending through the structure, and irrespective of other components or equipment which may be coupled to or mounted on the elongated member.

With this object in view, there is provided by the present invention a seal device for providing a weather seal between an elongate member and a surface through which the elongate member extends, such as a roof or wall of a building or like structure, the seal device comprising an apertured base member of resilient deformable material to be located in use in superimposed relation to the surface with the elongate member extending through the aperture, a sleeve of resilient deformable material integral with the base member and projecting from one side thereof, the sleeve member encompassing said aperture in the base member so that in use the elongate member also extends through the sleeve member, a rib formed integral with the sleeve and base members projecting outwardly from the external surface thereof, said rib extending generally down the length of the sleeve member and across the base member, whereby in use the sleeve and base member may be slit adjacent to and for the full length of the rib to permit opening of the sleeve member and base member for fitment about the elongate member, and clamp means secured to the sleeve member and base member and extending parallel to and for the length of the rib so the slit may be made between the rib and the clamp means, the clamp means being adapted to embrace the rib and be non resiliently deformed to grip the rib and sealably close the slit to secure the sleeve and base member around the elongate member, the sleeve member, when in use having at the end remote from the base member an aperture dimensioned to receive the elongate member in sealing engagement.

Conveniently, the clamp means comprises a number of clamp elements located in side by side relationship along the length of and adjacent the rib, whereby the closing of the slit and the clamping of the sleeve and base members by the clamp means to sealably close the slit, can be achieved, notwithstanding that the rib may follow a non-linear, curved or tortuous path after fitment of the seal device to the elongate member. The clamp means may comprise a series of clips, preferably secured together in a strip-like manner with the connection between adjacent clips sufficiently flexible or pliable so that each clip may embrace and grip the rib to form a sealed closure even though the rib may follow a non-linear path.

Preferably the rib is provided with a shoulder along the side remote from the clamp means, and the clips may be adapted to interengage with the shoulders when embracing and gripping the rib, thereby increasing the strength of the grip and seal between the clamp means and the rib. The clamp means may be in the form of a plurality of generally U-shaped clips with the clips joined one to the other along the base of the U to provide the required degree of flexibility of the strip to follow the non-linear contour of the rib. The clips having extended fingers along one side of the clamp means, the fingers being attached to the sleeve and/or base

member such as by being embedded in or bonded to or into the sleeve and/or base member.

The seal device constructed in the above manner is suitable for use in the conventional way by inserting the end of the elongated member through the sleeve member and thereafter sliding the seal device along the elongated member to take up the required position. However, the seal device in accordance with the present invention has the additional capability of being fitted to an elongated member, in situ projecting through a roof or like surface, without having to be threaded onto the elongated member from an end thereof. This is achieved by the operator splitting the sleeve and base member along beside the rib, or along a groove provided adjacent to, or in the rib. The operator may then open the seal device and place it about the elongated member so that the latter extends through the sleeve member. Thereafter the operator applies the clamp means to press and hold the two edges formed by the slit together in a sealed relation throughout their length, so that the seal device becomes an integral component again.

When the seal device is split and fitted to an elongate member extending through a roof, as above described, the clamped rib is located so as to be on the down side of the roof with respect to the elongate member, thereby reducing the risk of leakage of water through the reclosed slit. Nevertheless, the clamp means as provided to hold the two edges of the slit together in sealed relation is designed to be completely effective against the leakage of water therethrough.

The seal device as above described is constructed with the sleeve being of tubular form, preferably tapered, and with the base member in the form of an annular flange. In that form the sleeve and base member must be slit adjacent to the rib when the seal device is to be fitted in a situation where the sleeve may not be passed over an end of the elongate member. It is to be understood that the seal device may be initially constructed with the sleeve and base member already slit.

In an alternative construction, the sleeve and base member may be produced in a generally flat form of segmental shape, having the rib extending along one radial edge and the clamp means along the other radial edge. In subsequent use the two radial edges of the flat segmental shape are brought together and clamped to abut along the length of said edges, thereby forming a conical shape. The larger end of the conical shape forms the base member and the smaller end provides an aperture to receive the elongate member in sealing engagement.

This, as produced, flat form of the seal device substantially reduces manufacturing costs as the segmental shape can be produced in a relatively shallow die mould. It also reduces packaging, storage and transportation costs. When produced in this flat form and then rolled into the conical shape, the base member or flange is initially a continuation of the conical form of the sleeve and is then deformed at installation to extend outwardly from the lower end of the sleeve to provide the flange to be secured by suitable fastening devices to the sheet or structure surrounding the elongate member.

A separate annular ring of metal or other suitable non-resilient manually deformable material may be provided to be placed on the base member about the sleeve during installation. The fastening devices such as screws, rivets, or bolts, are fitting through suitable apertures provided in, or made during installation in, the ring, base member and sheet or structure so the base member is clamped between the ring and sheet or structure to establish an effective seal.

Conveniently, the base member which is made of a resilient material, has along at least part of it's length a member or members of non-resilient manually deformable material, such as a soft metal, attached thereto and may be adapted to be manually stretched in at least one direction and when so stretched to be capable of maintaining that portion of resilient material to which it is attached, correspondingly stretched.

Preferably the adaption of the manually deformable member to be stretched in the one direction is such that compressing of the manually deformable member may also be effected. In particular the adaption of the member may be such that it may be stretched along one edge and compressed along the opposite edge. This enables a portion of the member to be manually deformed in the plane thereof into an arcuate or curved form. The member or members are also manually deformable in the direction normal to the plane thereof so that it may be contoured along its length. This contouring of the member may be effected independently or in combination with stretching or compressing of the member.

Conveniently, the non-resilient manually deformable member is provided with a plurality of interruption along at least one edge, that edge extending substantially in said direction of desired stretch, whereby the member is stretched by increasing the width of the interruption at least along part of the length of the member. Preferably, interruptions are provided along each of two opposite edges of the member with alternate interruption extending from opposite edges of the member. The interruptions are preferably in the form of slits or slots that extend from the opposite edges more than half the width of the member, or at least overlap one another in the direction of the width of the member, conventiently in the longitudinal central region of the member.

The non-resilient manually deformable member may be attached to the base member by bonding to one face of the resilient material, either in a superimposed or inlaid relation having one face of the member exposed. Alternatively, the deformable member may be embedded in the resilient material of the base member. When the deformable member is embedded in the base member it is preferably that at least one face thereof be bonded to the resilient material of the base member.

In a construction wherein the seal device is manufactured in the flat form of segmental shape as above referred to, the member of deformable material will reduce in effective diameter as the radial edges of the segmental shape are brought together and clamped to form the conical sleeve and base flange. The member of deformable material is therefore provided with the slots or slits as above described to thus give the member the degree of extensibility and compressability in the circumferential direction to permit the required reshaping of the base flange into a completed annulas, extending generally outwardly from the larger end of the conical sleeve.

The manually deformable member may be a strip of metal, such as aluminum, with slots, or slits extending in from one or both longitudinal edges of the strip. The degree of stretch that the member may achieve without failure is increased with the length and number of the slots, or slits in the member.

One practical arrangement of the invention will now be described with reference to the accompanying drawings, which depict the invention applied to a sealing device of the type generally disclosed in the Australian Patent No. 514247.

In the drawings:

FIG. 1 is a perspective view from above of the seal device in accordance with the present invention.

FIG. 2 is a vertical section through the sealing device shown in FIG. 1 when assembled to an elongated tubular member.

FIG. 3 is a fragmentary view of a portion of the sleeve member of the seal device with the rib and clamp means of the present invention incorporated thereon.

FIG. 4 is a view of an alternative construction of the seal device in the as manufactured form.

FIG. 5 is a diagrammatic view of the seal device shown in FIG. 4 in the as used form.

FIG. 6 is a fragmentary view of portion of the seal device shown in FIG. 4 with the clamp strip in the assembled state.

The seal device as illustrated in FIG. 1 comprises an annular base flange 10 of resilient readily deformable material, such as natural or synthetic rubber, having an integral sleeve 11 of the same material extending from the upper face of the base flange. The sleeve 11 has a tapered portion 18 tapering toward the upper open end 12. The wall of the sleeve 11 is sufficiently flexible to accommodate misalignment of the upper end 12 relative to the other parts of the seal device, as may be necessary in normal use.

The smaller upper end 12 of the sleeve 11 is normally open and of a diameter to require enlargement thereof by stretching to fit a particular sized elongate member. As a result of the stretching the sleeve establishes a sealing contact with the elongate member.

Spaced along the tapered portion 18 are a plurality of external circumferential ridges 14 denoting where the sleeve may be cut off to suit larger elongate members of different diameters. The ridges also provide a reinforcement about the edge of the open end of the sleeve so formed.

As seen in part in FIG. 1, a rib 25 is provided down the external surface of the sleeve member 11 extending from the top edge thereof to the bottom of the sleeve member and then horizontally across the upper surface of the base flange 10 to the outer edge thereof. Although not shown in the drawings, it is preferable for the area at the junction of the sleeve 11 with the flange 10 through which the rib 25 passes, to be provided with a generous fillet rather than the relatively sharp corner normally provided at this junction.

The ring 13 is bonded to the upper face of the base flange 10 and is of a non-resilient manually deformable nature so that it may hold the base flange in a contoured form if desired. The ring 13 is split at 15 to provide for the rib 25 and clamp strip 32.

Adjacent to the ribs 25 is a clamp strip 32 bonded to or embedded in the rubber of the sleeve and base flange, and is adapted to co-operate with the rib 25 to form a sealed closure of a slit in the sleeve and flange as hereinafter described. In FIGS. 1 and 2 a mid-section of the clamp strip 32 is broken away to show the rib 25 therebeneath.

Also, as can be seen in FIG. 3, the rib 25 is provided with a shoulder 24 dividing the rib into a neck part 29 and head part 30. The shoulder 24 is preferably continuous throughout the length of the rib 25, but may be interrupted at selected locations along the length of the rib without departing from the effectiveness of the invention.

In the form as illustrated, the clamp strip 32 is made up of a series of U-shaped clamp elements 33 interconnected in a side by side relation by web elements 34. The clamp elements 33, in their initial state, have the arms 35 and 36 of the U outwardly directed from the base with the free ends 37 of arms 35 inwardly turned. The clamp elements in this configuration are shown in the top two elements in FIG. 3. When the arms 35 and 36 of the U-shaped clamp elements 33 are so spread, the head portion 30 of the rib 25 may be received between the arms 35 and 36 and the end portions 37 of the arms 36 may be seated in the neck part 29 at the base of the rib 25 beneath the shoulder 24.

The U-shaped clamp elements 33 of the clamp strip 32 each have a lateral extension at one side forming a plurality of fingers 42 that are secured to the sleeve 11 and base flange 10 to effect securement of the clamp strip 32 thereto. The fingers may be bonded to the external face of the sleeve and base flange, as shown in FIGS. 1 and 3, or embedded therein with or without bonding. The provision of a series of fingers rather than a continuous strip retains the flexibility of the clamp strip 32 arising from the clamp elements being interconnected by the web elements 34 only. It is also preferred to have a strip of rubber, such as the strip 38 integral with the wall of the sleeve, located within the clamp strip 32 along the side attached by the fingers to the sleeve. When the rib 25 is embraced by the clamp elements, and the elements are closed to grip the rib, the rib 25 will be pressed against that strip of rubber to improve the quality of seal therebetween.

The clamp strip 32 of the clamp element 33 may be conveniently formed from a one piece metal strip with the web elements 34 providing the required flexibility between adjoining clamp elements so that the clamp strip may closely follow the contour of the sleeve member and base flange when they are in the working fitted condition to the elongated member and the roof sheet. In an alternative construction, the clamp element 33 may be made as individual components secured to the sleeve and base flange and/or fitted to a backing strip of suitable flexible material, such as a resilient plastic material, which may be moulded or extruded on to the respective clamp elements to secure them in the form of a strip.

It will be appreciated from the preceding description that the provision of the rib 25 and clamp strip 32 does not interfere with the original construction of the seal device, and accordingly, the seal device may be used in the manner similar to the prior art and as described in the prior Australian Patent No. 514247 previously referred to. In that previous mode of use, the seal device is threaded onto the elongated member from one end thereof, and thus it was necessary for the elongated member to be free of any protrusions or attachments, that would prevent the seal device being moved from the end thereof to the desired location adjacent the roof or the surface through which the elongated member extended.

However, when it is desired to fit the seal device to an elongated member 8 already in position, extending through a roof or like cladding member 9 and being coupled to other components or equipment to prevent the fitment of the seal device via the end of the elongated member, then the operator may split the sleeve

and base flange between the rib 25 and clamp strip 32 for the total length of the rib 25 thereof. In that situation the sleeve member 11 and flange 10 are severed completely along one side so that the seal device may be opened out and placed about the elongated member without the necessity of threading the elongated member through the sleeve member and flange. After the seal device has been so assembled to the elongated member the edges of the slit are brought together and the clamp strip 32 is located to embrace the rib 25 to re-establish continuity of the wall of the sleeve member 11 and of the base flange 10.

The operator may then close the clamp elements by deflecting the arms 35 and 36 inwardly by the use of a pair of pliers or a like hand tool. This will bring the arms 35 and 36 into a generally parallel relation as shown at 39 in FIG. 3, thereby compressing the edges of the slit tightly to form a seal. It will be appreciated that when the arms of the clamp elements are so squeezed together, the end portion 37 of the arms 35 will pinch the neck portion 29 of the rib and be firmly seated beneath the head portion 30. These various interactions between the clamp elements and the rib ensure that the clamp element cannot be accidentally dislodged from the rib 25, and the rib 25 is firmly compressed to form an effective weather tight seal therebetween.

In the above described construction the sleeve 11 and base flange 10 are slit adjacent to the rib 25 when the seal device is to be installed, however, it is to be understood that the seal device may be manufactured with the sleeve and base flange already split, with the clamp strip integral therewith and extending along one edge of the slit and the rib extending along the other edge of the slit.

In a further alternative construction, as illustrated in FIG. 4 of the drawings, the seal device may be manufactured in the form of a generally flat rubber moulding of segmental shape. In the form illustrated the segment is approximately 270° of arc so the two radial edges 50 and 51 have an included angle of about 90°. A rib 64 and clamp strip 62, generally constructed as previously described, are provided along the edges 50 and 51 in a like manner to that previously described.

Along the perimetal area 49 of the flat moulding is a metal strip 58 secured to the rubber moulding. The strip 58 may be bonded to the surface of the moulding. inlaid therein, or embedded therein with or without bonding between the metal and rubber. The strip 58 has slots 60 extending in from each of the longitudinal edges 61 of the strip. The junction of the slots with the edge of the strip are radiused to reduce the risk of the corners piercing the rubber. The metal strip may be stretched in the longitudinal direction by applying tension to the strip to open out, that is widen, the slots 60. This stretching of the strip is a non-resilient stretch and will effect a similar stretching of the rubber of the moulding in the area of the metal strip,. The functioning of the slotted metal strip has been further described earlier in this specification.

When the flat moulded seal device is to be used the two radial edges 50 and 51 are brought into abutting relation about the elongate member, and the clamp strip 62 and rib 65, are operatively interengaged to form a sealed joint between the edges 50 and 51. There is thus formed a generally conical shaped sleeve 11*a* with the perimetal area 49, carrying the strip metal 58, generally co-extensive with the sleeve 11*a* as shown in FIG. 5. The perimetal area 49 may then be increased in length at the lower edge by stretching the metal strip 58 to increase the width of the slots 60 and thereby increase the circumferential length of the lower edge of the perimetal area. The ability to increase the length in a non-resilient manner enables the perimetal area to be formed into an annular flange 10*a* projecting outwardly around the lower large end of the sleeve 11*a* and co-axial therewith, as shown in broken outline in FIG. 5.

In a preferred construction, the clamp strip is as shown in FIG. 6 comprising a plurality of clamp elements 63 of U shape, interconnected by web sections 69. The respective arms 65 and 66 of each clamp element are of the same construction but of opposite hand, with respective inwardly directed end portions 67 and 68. During moulding of the sleeve and base flange of either of the previously described embodiments of the sealing device the inwardly directed end positions 67 of the arms 65 are embedded in the rubber of the sleeve and base flange moulding. As a result of this embedding of the end portion of arms 65 in the moulding the clamp strip is securely attached to the moulding, with the moulding extending through the gaps formed between adjacent clamp element arms 65. Also a continuous strip 71 of rubber is provided within the clamp elements adjacent the arms 65.

The securement of the clamp strip to the sleeve and flange as above described is primarily for retaining them in assembly prior to installation. Upon installation, the closing of the clamp elements about the rib 25 to clamp the two edges of the sleeve and flange together will effect lasting securement of the clamp strip to the moulding forming the sleeve and base flange.

In each of the above described constructions of the seal device, when being installed the base flange 10 is manually deformed to closely follow the contour of the surface of the cladding sheet 9 to which it is being fitted. The base flange is secured to cladding sheet 9 through which the elongated member 8 extends by screws, bolts or rivets that pass through the base flange and cladding sheet. Where the slotted form of the metal strip is incorporated in the base flange, the screws, bolts or rivets are passed through a part of the metal strip or through a washer or the like. The installation of the screws, bolts or rivets achieves a clamping or compression of the resilient material of the base flange between the metal strip and the cladding sheet to provide an effective weather tight seal therebetween. If desired, a sealant paste or the like may be used between the cladding sheet and base flange.

As previously referred to, the sealing device is preferably installed so the side thereof on which the rib and clamp means are provided is located on the lower side or downstream side with respect to the water flow over the roof or cladding sheet. This results in the slit adjacent the rib facing downstream with respect to the water flow and therefore reduces the risk ofleakage due to incorrect installation or damage subsequent to installation.

In the embodiment illustrated in FIGS. 4 and 5, a fold or pleat 70 is formed at the junction of the sleeve 11*a* and base flange 10*a* during moulding of the seal device. The fold 70 is a maximum height at the mid-portion of the length off the fold and progressively decrease toward each end thereof. As seen in FIG. 4 the fold 70 creases a short distance from the respective radial edges 50 and 51. This results in an opening being left on either side of the ridge formed by the clamp elements and the rib assembly of the seal device when installed. Accord-

ingly, as this ridge is on the downstream of the installed seal device, water collecting between the fold 70 and sleeve 11*a* may freely drain therefrom around the respective ends of the fold.

This form of fold may also be incorporated in the seal device as described with reference to FIG. 1. A further advantage of the fold 70 is that it provides an increase in the flexibility between the sleeve and base flange to accommodate relative misalignment and movement therebetween.

I claim:

1. A seal device for providing a weather seal between an elongate member and a cladding sheet through which the elongate member extends, the seal device comprising an apertured base member of resilient deformable material to be located in use in superimposed relation to the sheet with the elongate member extending through the aperture, a sleeve of resilient deformable material integral with the base member and projecting from one side thereof, the sleeve member encompassing said aperture in the base member so that in use the elongate member also extends through the sleeve member, a rib formed integral with the sleeve and base member projecting outwardly from the external surface thereof, said rib extending generally down the length of the sleeve and across the base member to the outer edge thereof, whereby in use the wall of the sleeve and base member is slit adjacent to and for the full length of the rib to permit opening of the sleeve and base member for fitment about the elongated member, and clamp means secured to the sleeve and to the base member extending parallel to and for the length of the rib so the slit can be made between the rib and the clamp means, the clamp means comprises a series of clips interconnected in a strip form, the interconnection between the clips being flexible at least in the longitudinal direction, each clip having a portion to receive and embrace the rib and is non-resiliently deformable to grip the rib to thereby sealably close the slit to secure the sleeve and base member around the elongated member, wherein the sleeve and base member are molded integral in a generally planar form of segmental shape, having two substantially radial edges, wherein each of said clips has a lateral extension at one side forming a finger secured to said sleeve and said base flange to effect securement of said clamp strip thereto, said rib extending along one said radial edge and the clamp means extending along the other said radial edge, said sleeve having an upper edge portion having a plurality of radially-spaced circumferential guide ridges for ease of cutting the edge portion to tightly fit the elongate member.

2. The weather seal as defined in claim 1, wherein a perimetal margin portion extending between said radial edges and has bonded to one face thereof a continuous metal strip adapted to be non-resiliently stretchable in the circumferential direction, whereby said strip will be stretched when the perimetal margin portion is deformed outwardly to form the base member and thereby retain the base member in that disposition.

3. The weather seal as defined in claim 1, wherein the strip of metal has circumferentially spaced slots formed therein extending from at least one edge thereof in a direction across the direction of stretch.

4. The weather seal as defined in claim 3, wherein the slots in the strip of metal extend from opposite edges of the strip.

5. The weather seal as defined in claim 4, wherein the slots in the strip of metal alternately extend from opposite edges of the strip.

6. The weather seal as defined in claim 5, wherein the annular member of non-resilient deformable metal is located about the sleeve and bonded in face to face relation to the base member and is adopted to be manually stretchable in the circumferential direction.

7. The weather seal as defined in claim 6, wherein the annular member has circumferentially spaced slots formed therein extending from an edge thereof in a direction across the direction of stretch.

8. A seal device for providing a weather seal between an elongate member and a cladding of a building sheet through which the elongate member extends, the seal device comprising an apertured base member of manually deformable resilient material to be located in use in superimposed relation to the sheet with the elongate member extending through the aperture, a sleeve of manually deformable resilient material integral with the base member and projecting from one side thereof, the sleeve member encompassing said aperture in the base member so that in use the elongate member also extends through the sleeve member, a rib formed integral with the sleeve and base member projecting outwardly from the external surface thereof, said rib extending generally down the length of the sleeve and across the base member to the outer edge thereof, whereby in use upon splitting the wall of the sleeve and base members adjacent to and for the full length of the rib permits opening of the sleeve and base member for fitment about the elongate member, and clamp means secured integrally to the sleeve and to the base member and extending parallel to and for the length of the rib so that upon splitting the slit is made between the rib and the clamp means, the clamp means comprises a series of clips interconnected in a strip form, the interconnection between the clips being flexible at least in the longitudinal direction, each clip having a portion to receive and embrace the rib and is non-resiliently deformable to grip the rib and thereby by the deformation alone sealably close the slit to secure the sleeve and base member around the elongate member, wherein each of said clips has a lateral extension at one side forming a finger secured to said sleeve and said base flange to effect securement of said clamp strip thereto, said rib having a neck portion for conforming the rib to the clamp means.

9. The weather seal as defined in claim 8, wherein each clip is of generally U shape cross-section and the clips are interconnected in spaced relation at the base of form a channel like strip, one arm of each U shape clip on the same side of each clip being secured to the sleeve or base member at a location so the slit can be made between the rib and arms of the clips secured to the sleeve and base member.

10. The weather seal as defined in claim 9, wherein each said one arm has an end portion thereof turned inwardly toward the other arm of that clip, said turned-in portion on each clip being embedded in the sleeve or base member.

11. The weather seal as defined in claim 10, wherein the sleeve and base member are moulded integral in a generally planar form of segmental shape, having two substantially radial edges, said rib extending along one said radial edge and the clamp means extending along the other said radial edge.

12. The weather seal as defined in claim 11, wherein the perimetal margin portion of said segmental shape

extending between said radial edges forms and said base, has bonded to one face thereof a continuous metal strip adapted to be non-resiliently manually stretchable in the circumferential direction, whereby said strip will be stretched when the perimetal margin portion is deformed outwardly to form the base member and thereby retain the base member in that disposition.

13. The weather seal as defined in claim 12, wherein the strip of metal has circumferentially spaced slits formed therein extending from at least one edge thereof in a direction across the direction of stretch.

14. The weather seal as defined in claim 13, wherein the slits in the strip of metal extend from opposite edges of the strip.

15. The weather seal as defined in claim 14, wherein the slits in the strip of metal alternately extend from opposite edges of the strip.

16. The weather seal as defined in claim 8, wherein the sleeve and base member are formed with said slit therein located between and extending the length of said rib and clamp means.

17. The weather seal as defined in claim 8, wherein an annular member of non-resilient deformable metal is located about the sleeve and bonded in face to face relation to the base member whereby the base member will take-up and retain any contoured shape imparted to the annular member.

18. The weather seal as defined in any one of claims 8 to 10, wherein an annular member of non-resilient deformable metal is located about the sleeve and bonded in face to face relation to the base member and is adopted to be manually stretchable in the circumferential direction.

19. The weather seal as defined in claim 18, wherein the annular member has circumferentially spaced slot or slits formed therein extending from an edge thereof in a direction across the direction of stretch.

20. The weather seal as defined in claim 19, wherein the slots or slits in the annular member extend from opposite edges of the annular ember.

21. The weather seal as defined in claim 20 wherein the slits in the annular member alternately extend from opposite edges of the annular member.

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[54] **FLEXIBLE PENETRATION FITTING**

[75] Inventors: **Sergio M. Bravo**, Los Alamitos; **Don K. Mukai**, Pasadena, both of Calif.

[73] Assignee: **S. Bravo Systems, Inc.**, Buena Park, Calif.

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[52] **U.S. Cl.** **285/139.2**; 285/139.3; 285/148.25; 285/192; 285/236

[58] **Field of Search** 285/48, 49, 50, 285/137.1, 139.2, 139.3, 142.1, 148.25, 205, 226, 229, 236, 348, 368, 192

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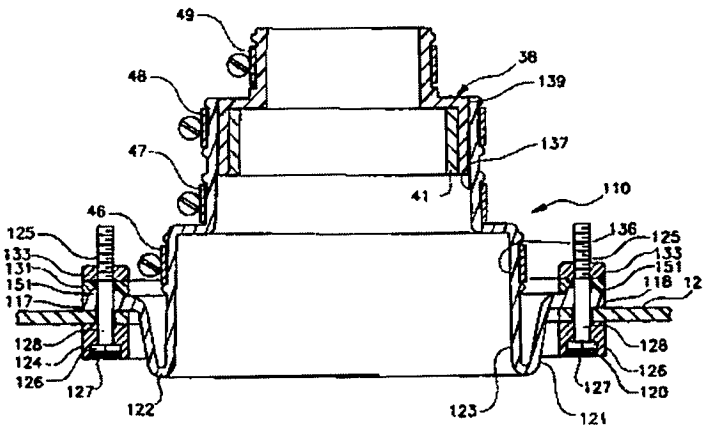
Primary Examiner—Dave W. Arola

Attorney, Agent, or Firm—Christie, Parker & Hale, LLP

[57] **ABSTRACT**

A flexible penetration fitting is provided for sealing the hole through which a pipeline penetrates a wall of an underground containment box. The penetration fitting includes a flexible boot with a sealing flange for providing a first seal against the inside wall of the box. The sealing flange is held against the wall by a backing ring placed against the outside wall of the box. The backing ring includes a plurality of studs extending through the wall and into the box. A compression ring with a plurality of holes is placed over the sealing flange with the studs of the backing ring extending though the holes. A plurality of nuts are threaded to the studs to hold the sealing flange firmly against the inside wall of the box. The flexible boot also includes a sleeve for providing a second seal against the outside surface of the pipeline. The sleeve is stepped with different sized openings so as to be able to receive different sizes of pipelines. A hose clamp placed around the sleeve at the appropriate sized opening seals the sleeve against the pipeline.

5 Claims, 10 Drawing Sheets



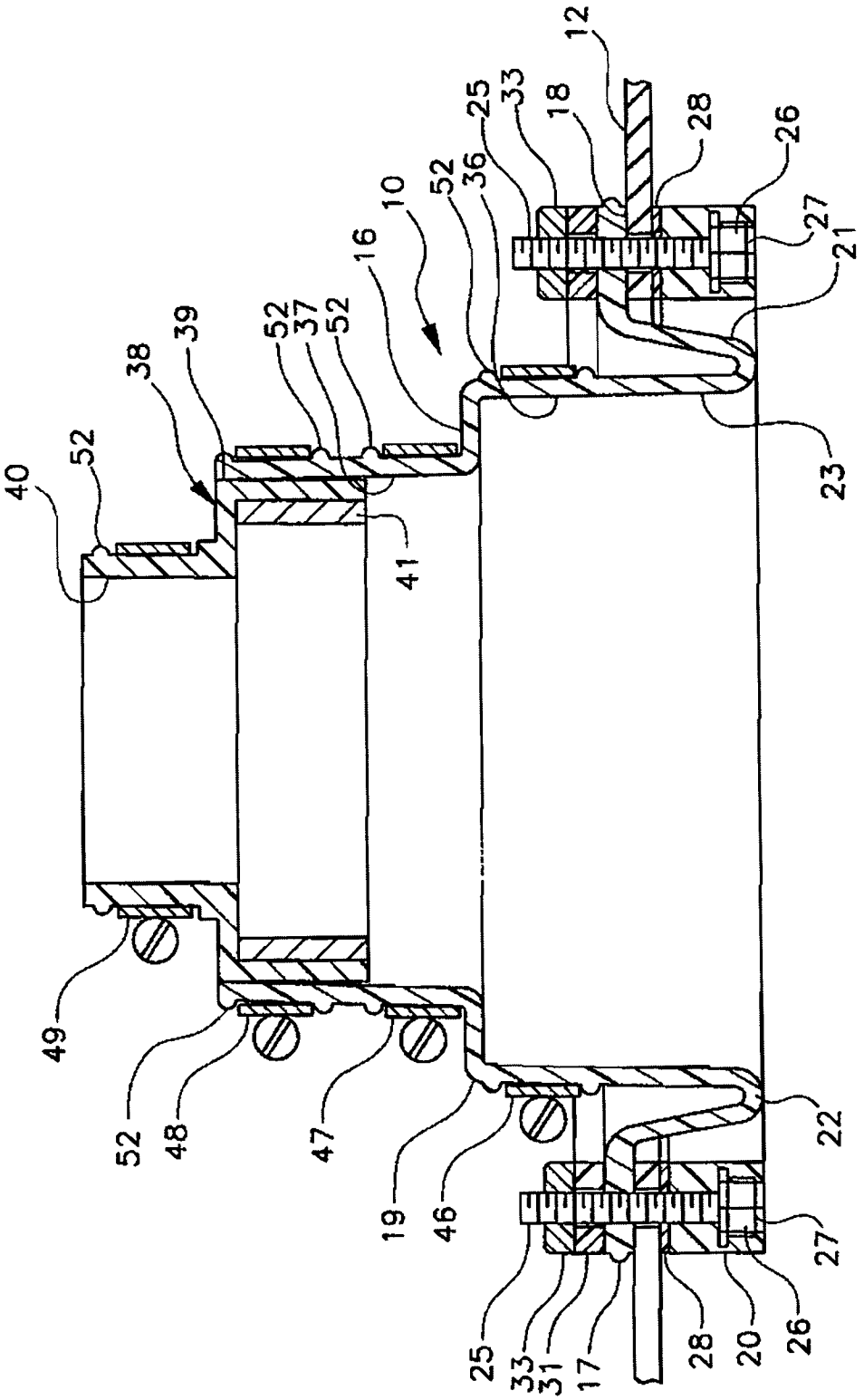

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FIG. 2

FIG. 3

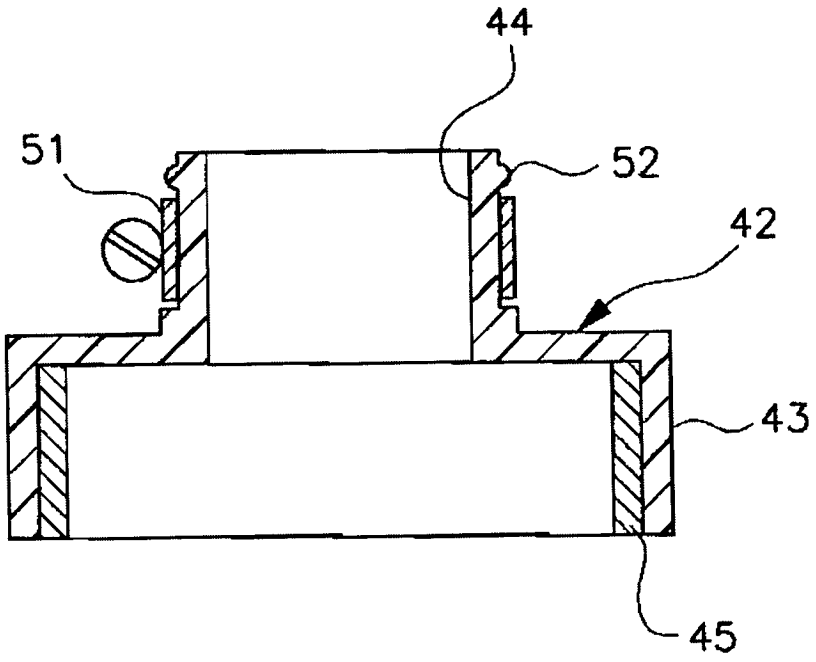

FIG. 4a

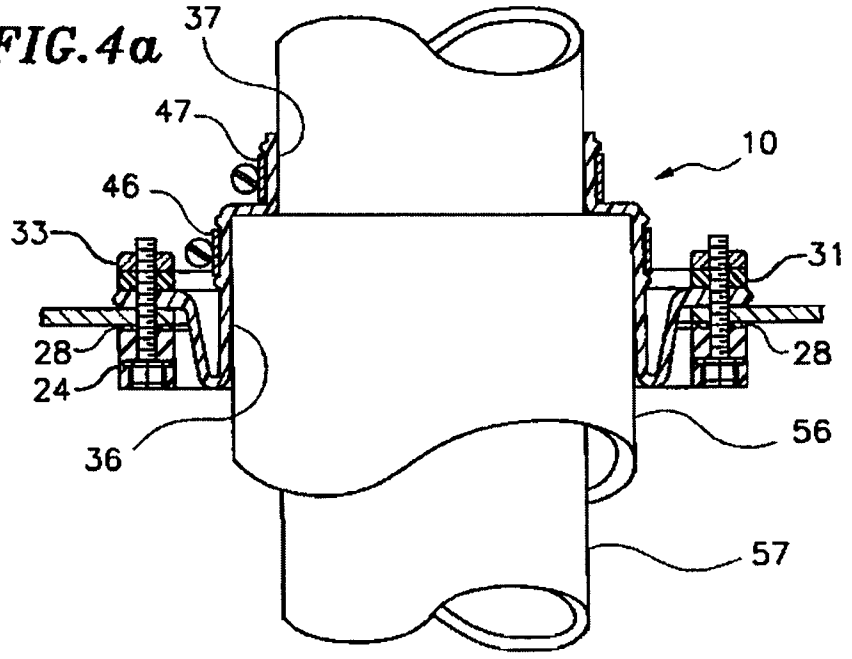
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FIG. 4b

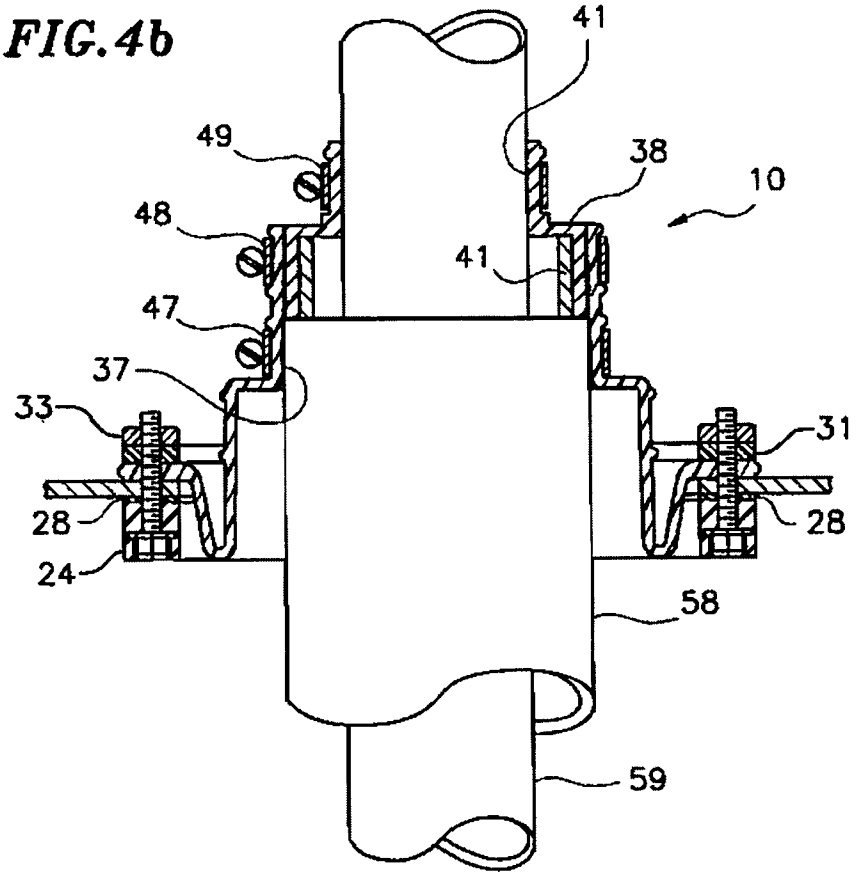
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FIG. 4c

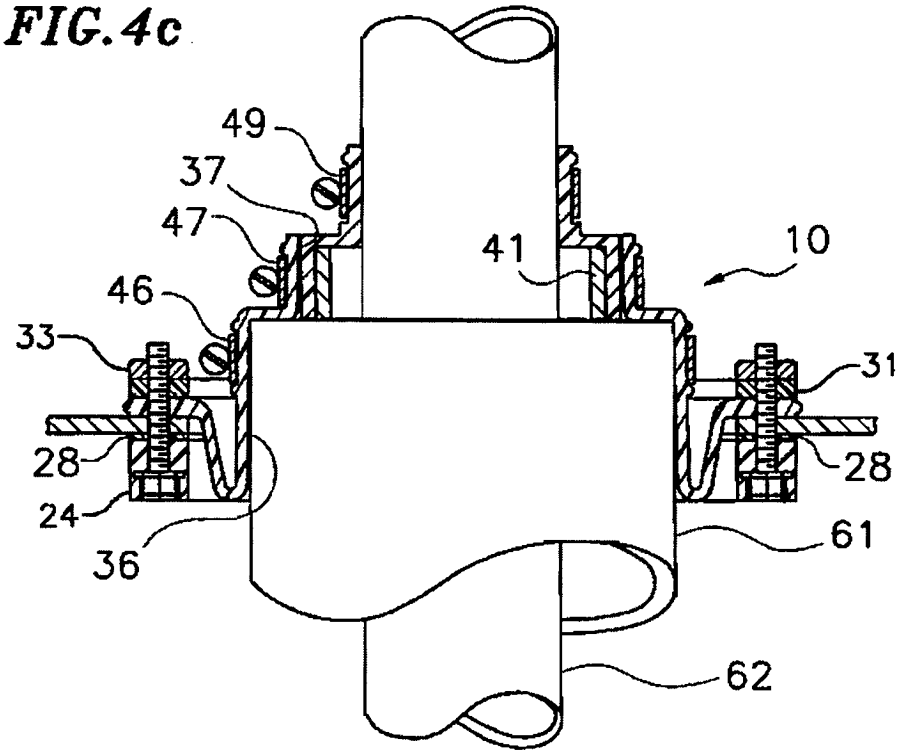

FIG. 4d

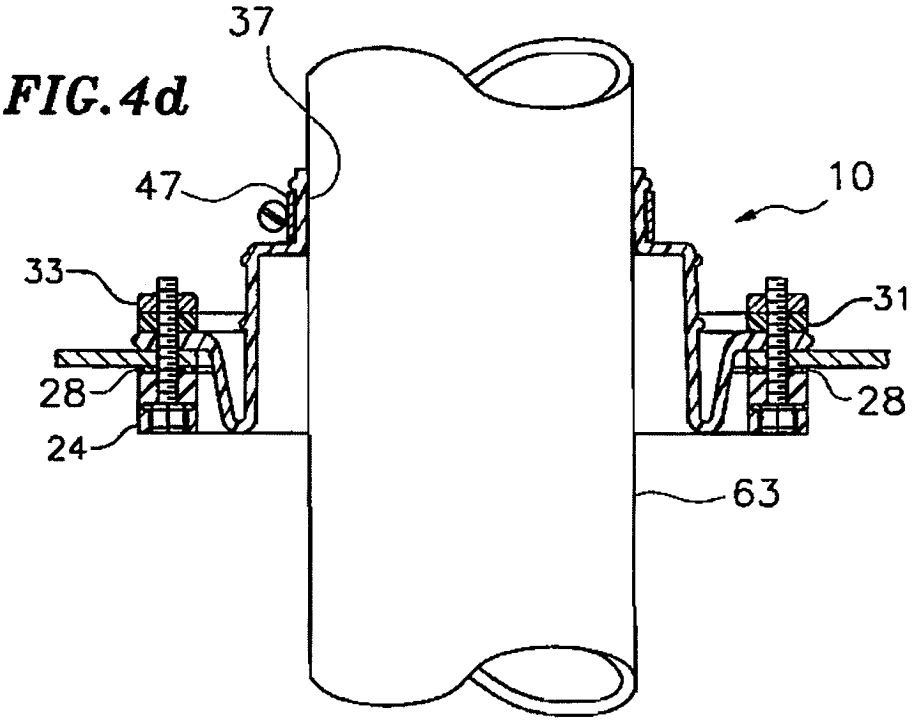

FIG.5

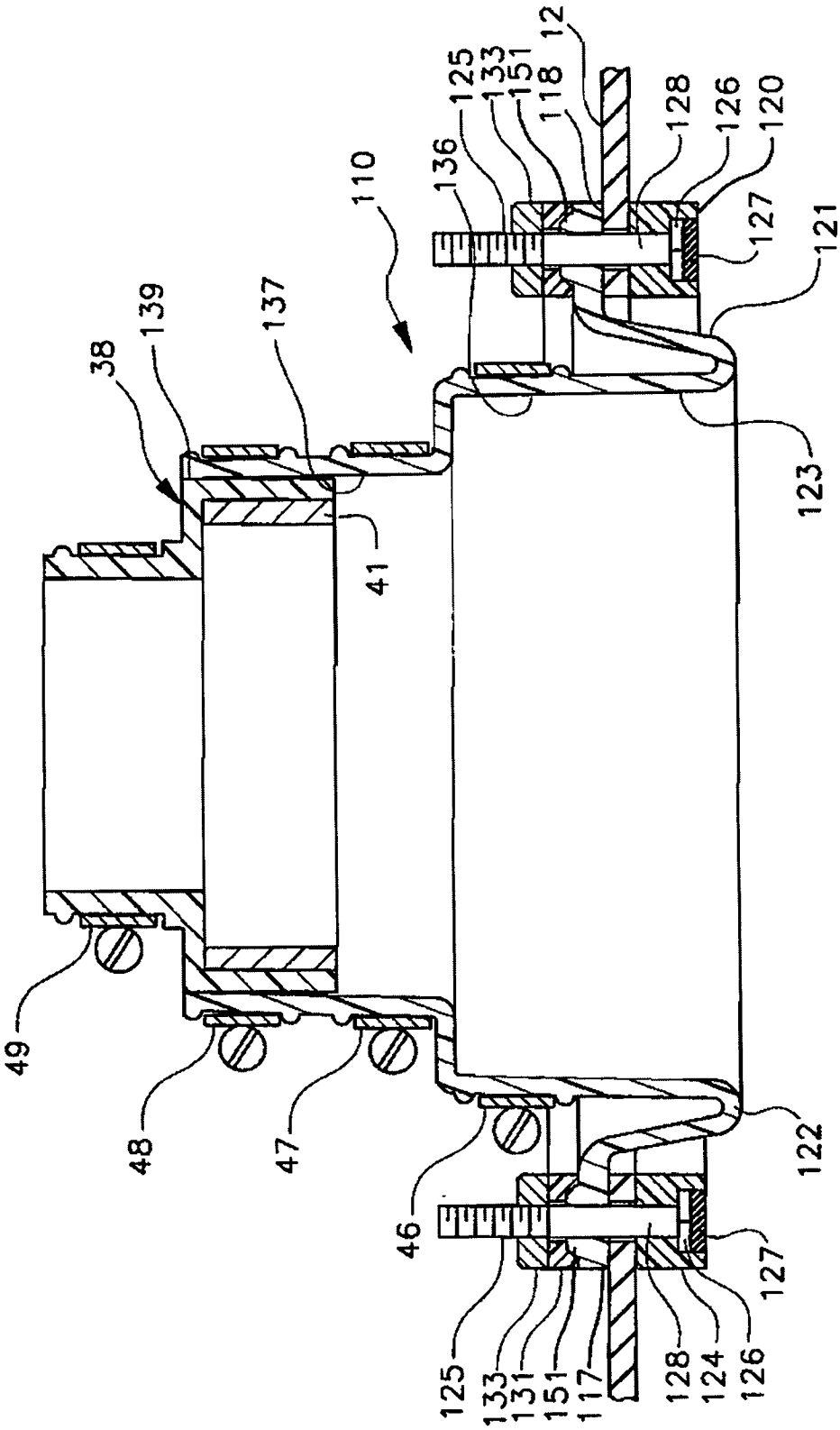
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FIG.6

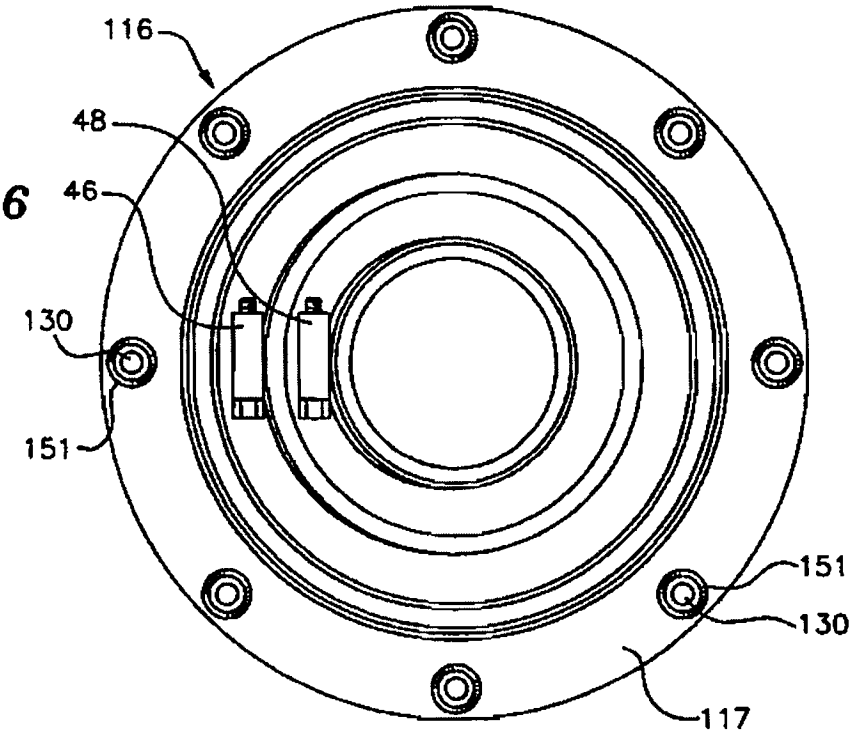


FIG.7

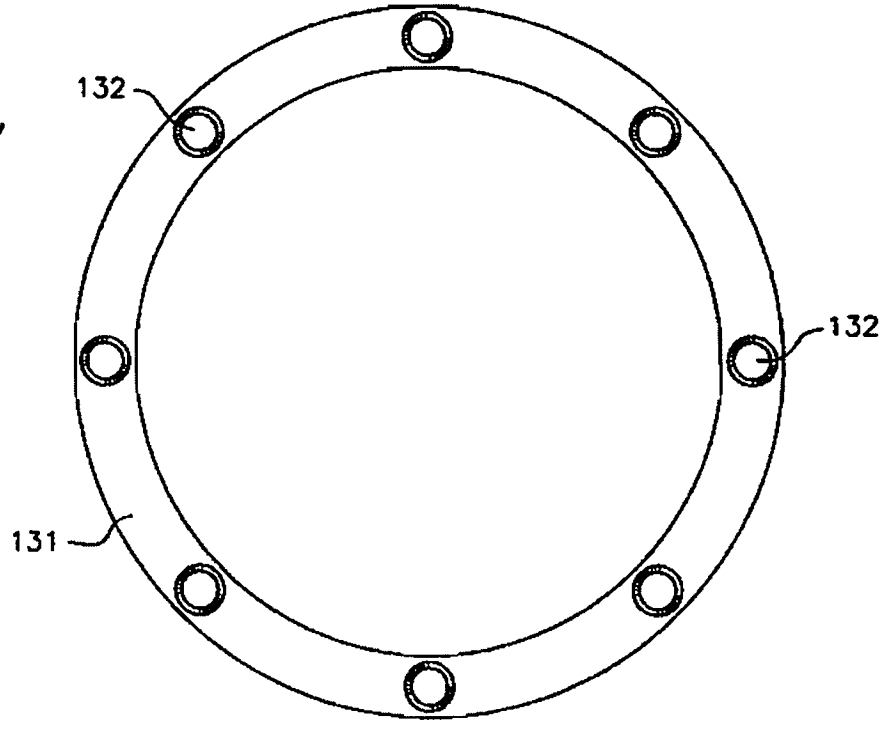


FIG.8

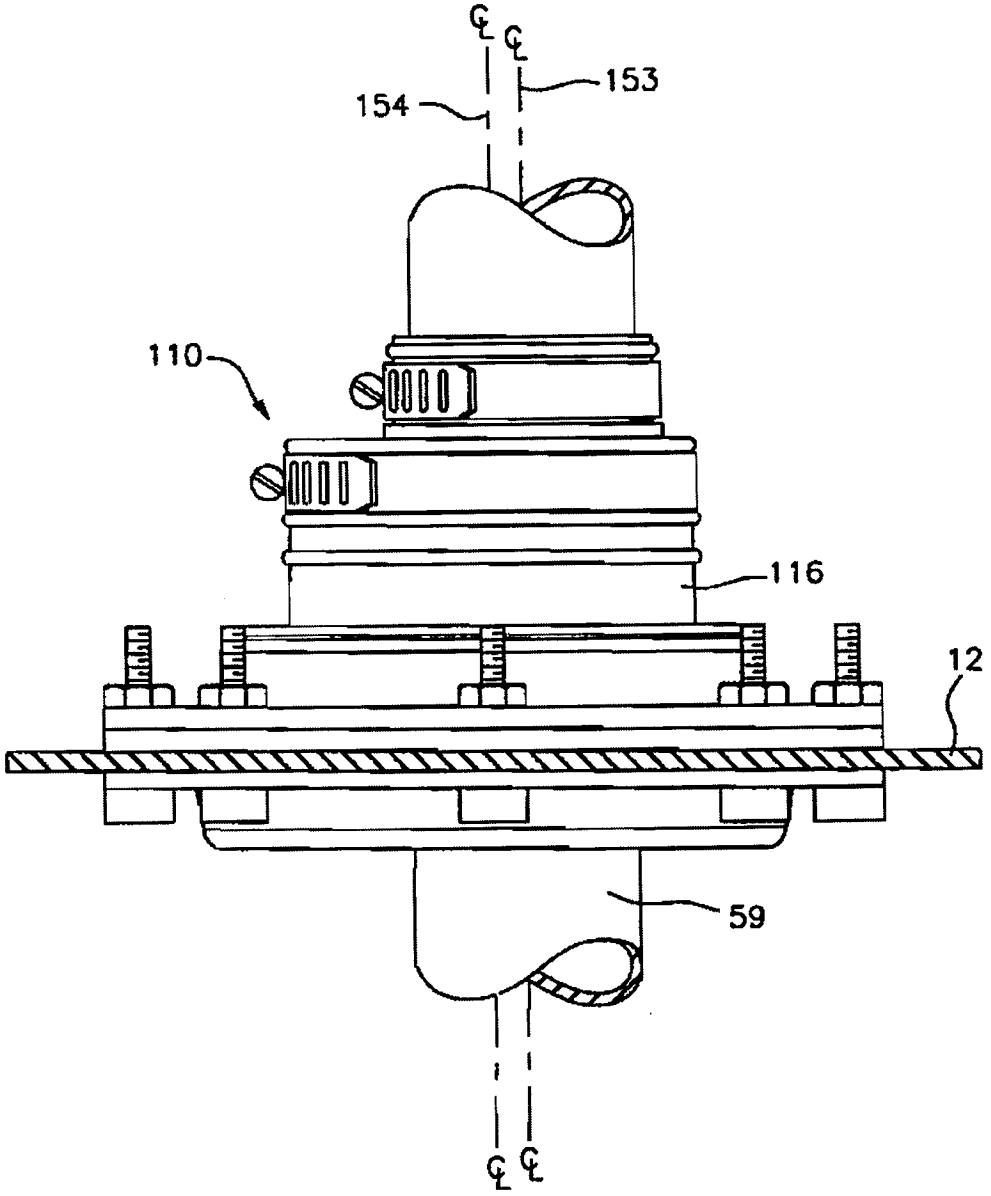


FIG.9

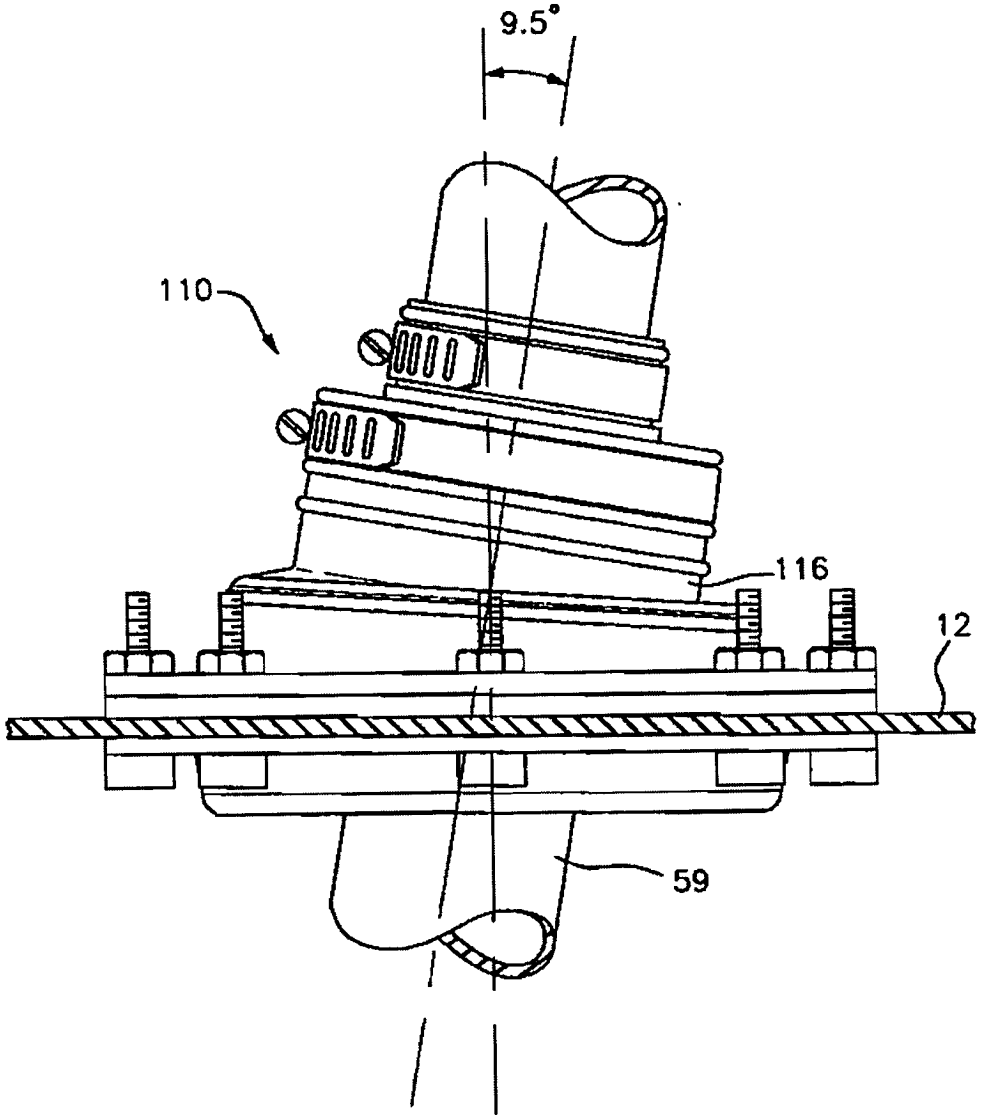
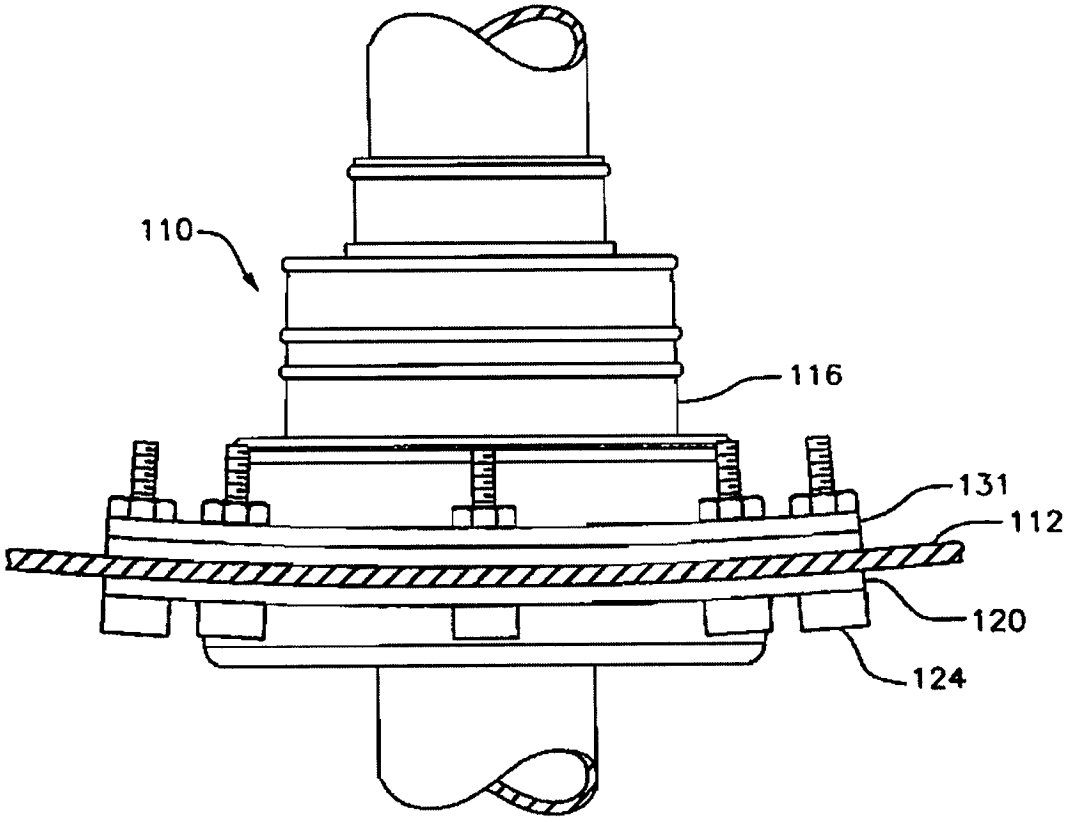


FIG. 10



FLEXIBLE PENETRATION FITTING

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of patent application Ser. No. 08/714,471, filed Sep. 16, 1996, abandoned.

FIELD OF THE INVENTION

The present invention relates to a flexible penetration fitting for use with a secondary containment box. More particularly, it relates to a universal penetration fitting that can be used with a broad range of sizes of flexible or rigid pipeline including various configurations of coaxial pipelines. The penetration fitting is also simple to replace in the event it becomes damaged after installation.

BACKGROUND OF THE INVENTION

For several years there has been a growing awareness of air and water pollution problems caused by leaking liquids such as gasoline that flow through buried pipelines such as those present at gasoline service stations. As a result, secondary containment systems have been developed for these systems. A secondary containment system typically includes a primary pipeline in which a product such as gasoline flows from an underground storage tank to a product dispenser. The system also includes a secondary pipeline that surrounds the primary pipeline. The purpose of the secondary pipeline is to contain any fluid that may leak from a damaged primary pipeline, and prevent the fluid from contaminating the surrounding ground. The secondary pipeline is generally monitored for fluid collection so that any leak in the primary pipeline can be repaired promptly.

Fittings known as bulkhead fittings or penetration fittings are generally used in combination with secondary containment systems to permit a buried pipeline to penetrate the wall or bulkhead of a containment box. Containment boxes are liquid-tight boxes associated with connections in the primary pipeline. For example, containment boxes are often provided under product dispensers, at product pumps, or at other junctions in the primary pipeline to contain any product that may leak or spill from the primary pipeline associated with such equipment. A penetration fitting prevents any such liquid that is collected in a containment box from contaminating the ground by sealing the hole in the wall through which the pipeline penetrates the wall of the containment box.

Many different types of penetration fittings have been developed. A popular type of penetration fitting is a boot made from a resilient elastomeric material which imparts flexibility to the joint between the pipeline and the containment box. One such a boot is disclosed at FIG. 22 of U.S. Pat. No. 5,297,896 to Webb. According to the Webb patent the containment box includes a pipe entry hole through which the pipeline extends. Surrounding the entry hole are a plurality of stud holes which assist in fastening the boot to the wall of the containment box. The boot is installed from the outside of the containment box and includes a flexible sleeve section extending from a sealing flange. While the sealing flange is located outside the box, the sleeve extends through the pipe entry hole and into the box. The sealing flange includes integral studs that extend through the stud holes of the containment box. The studs also extend through a plurality of holes in a compression ring located in the box. Nuts are threaded over the studs to press on the compression ring which in turn pulls the sealing flange against the outer surface of the wall of the containment box to effect the seal. The pipeline extends into the box through the flexible sleeve portion of the boot and is sealed to the sleeve portion with a hose clamp.

A similar penetration fitting is sold by Environ Products, Inc. of Lionville, Pa. This penetration fitting additionally includes a return bend in the flexible tube portion such that the sleeve is made of a flexible tube that first extends away from the containment box and then turns inward on itself to extend through the hole in the wall of the containment box. Such a return bend provides further flexibility to the boot.

Fittings with boot portions that are stepped to accommodate two different sizes of pipes are also known. Such penetration fittings allow a single fitting to seal against two different sizes of pipeline where the two pipelines are provided in a coaxial arrangement. Such penetration fittings can also include inserts that can be clamped in place within the flexible tube to allow a single penetration fitting to accommodate different sizes of pipelines. Examples of such penetration fittings and inserts are those sold by Total Containment, Inc. of Exton, Pa.

Because prior art penetration fittings include a boot made from a resilient material, the boot can periodically crack or tear. If the integrity of a penetration fitting is compromised due to a crack or tear in the boot, it must be replaced. However, one important problem with prior art penetration fittings is that they generally cannot be easily removed and reinstalled. Because such a penetration fitting is installed on the containment box from the outside, excavation is required to put a new penetration fitting in place. Such excavation can lead to extensive maintenance costs as well as prolonged downtime of a service station.

SUMMARY OF THE INVENTION

The penetration fitting of the present invention is used for forming a seal between a pipeline and a wall of a containment box. An optional gasket is placed on the outside surface of the wall of the box. A backing ring is also provided outside of the box with a plurality of studs extending from it. The studs are oriented to extend through a plurality of holes in the gasket and into the box. A flexible boot is provided with a sealing flange for placement against the inside surface of the wall. The sealing flange includes a plurality of holes through which the studs extend.

A compression ring is provided over the sealing flange inside the box. The compression ring also has a plurality of holes through which the studs extend. The boot is sealed to the inside wall of the box at the sealing flange by threading nuts to the studs which press the compression ring against the sealing flange and press the sealing flange against the wall. The optional gasket between the backing ring and wall of the box provides further sealing in the event there is leakage through the holes in the sealing flange.

Extending from the sealing flange is a sleeve for receiving the pipeline. In the preferred embodiment the sleeve includes a return bend which provides added flexibility to the boot. The preferred embodiment also includes a stepped sleeve configuration in which the circumference of the sleeve decreases in increments along its length. This configuration permits the boot to accommodate a number of different sizes of pipelines including coaxial pipelines having inner and outer pipelines. A particular pipeline is sealed to the sleeve by a hose clamp at the appropriate location along the length of the sleeve where the pipeline best fits. Any portion of the sleeve smaller than the pipeline can be removed easily with a utility knife.

An important benefit of the penetration fitting of the present invention is that once the backing ring is in place, the boot can be installed entirely from inside the containment box. This permits a damaged boot to be replaced without the need for excavating around the containment box.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features, aspects, and advantages of the present invention will be more fully understood when considered with respect to the following detailed description, appended claims, and accompanying drawings where:

FIG. 1 is an exploded perspective view of a flexible penetration fitting of the present invention;

FIG. 2 is a sectional elevation view of the penetration fitting of FIG. 1;

FIG. 3 is a sectional elevation view of an alternative insert for use with the penetration fitting of FIG. 1;

FIGS. 4*a*–4*d* are sectional elevation views of the penetration fitting of FIG. 1 when used in various pipeline configurations;

FIG. 5 is a sectional elevation view of another embodiment of the invention;

FIG. 6 is a top plan view of the flexible boot of FIG. 5;

FIG. 7 is a bottom plan view of the compression ring of FIG. 5;

FIGS. 8 and 9 are elevation views of the penetration fitting of FIG. 5 illustrating the flexibility of the boot when installed; and

FIG. 10 is an elevation view partly in section illustrating the penetration fitting of FIG. 5 installed on a curved wall.

DETAILED DESCRIPTION

According to the present invention, a flexible penetration fitting 10 as illustrated in FIGS. 1 and 2 is provided to seal a wall 12 of an underground containment box at the point where a pipeline (not shown) penetrates the wall. The containment box includes a first pipe entry hole 13 through which the pipe extends and a plurality of mounting holes 14 arranged around the entry hole for mounting the penetration fitting to the containment box.

The penetration fitting includes a flexible boot 16 made of a resilient oil resistant elastomeric material. The boot includes a ring-shaped sealing flange 17 for providing a seal against the inside surface 18 of the containment box wall. The boot also includes an integral flexible tube portion 19 that extends from the sealing flange. In the preferred embodiment, a first outwardly extending portion 21 of the tube extends in an outward direction away from the containment box. The tube then forms a return bend section 22 where it turns back on itself in an inward direction and back into the containment box to form a sleeve section 23. The sleeve section provides a sealing surface for sealing against the pipeline as will be discussed in further detail below.

The penetration fitting also includes a backing ring 24 provided outside the containment box. The backing ring includes a ring portion 20 with a plurality of studs 25 extending in a direction perpendicular to the plane of the ring portion. Preferably, eight studs are provided spaced equidistantly around the circumference of the backing ring. In the preferred embodiment the ring portion of the backing ring is made of a durable polymeric material with eight bolts 26 fastened to the backing ring by embedding their heads 27 within the backing ring. The threaded shafts of the bolts act as the studs for the backing ring. The backing ring is placed around the pipe entry hole outside the containment box with an optional gasket 28 between it and the wall. The studs of the backing ring extend through a plurality of holes 29 in the surface of the gasket, through the plurality of mounting holes in the wall of the box and into the box. The studs further extend through a plurality of holes 30 in the sealing flange of the boot.

A compression ring 31, also with a plurality of holes 32 for cooperating with the plurality of studs is provided inside the containment box. The compression ring is preferably made of a fairly rigid material compared to that used for the flexible boot. While the compression ring may be made of metal, it is preferably made of a fairly rigid polymeric material such as that used for the ring portion of the backing ring. Eight nuts 33 are threaded to the studs and press the compression ring against the sealing flange to press the sealing flange against the inside wall of the containment box sealing the boot to the containment box.

The flexible sleeve of the boot is designed to receive a variety of different pipe sizes. This is achieved by a stepped configuration in the circumference of the sleeve. A first circumference 36 is provided on the sleeve at a point near the sealing flange. The first circumference is capable of receiving a first pipe with a relatively large diameter. As the sleeve extends away from the sealing flange, the first circumference necks down to a second circumference 37 for receiving a second pipe with an intermediate diameter.

In the preferred embodiment, the penetration fitting also includes a first insert 38 having an outside diameter 39 for cooperating with the second circumference of the sleeve. The outside diameter necks down to a narrower section with an inside opening 40 for receiving a third pipe with a relatively small diameter. A structural ring 41 made of a fairly rigid material is provided inside the first insert at the first diameter to prevent either the insert or the sleeve from collapsing when the insert is attached to the sleeve. A second insert 42 as illustrated in FIG. 3 is also provided similar to the first insert. The second insert has an outside diameter 43 for cooperating with the second circumference of the sleeve and an opening 44 for receiving a fourth pipe with a relatively small diameter different from the diameter of the opening of the first insert. Like the first insert, the second insert includes a structural ring 45 for preventing the insert or the sleeve from collapsing when attached to the sleeve. Preferably, the first and second inserts are made of a resilient elastomeric material similar to that used for the boot. The structural rings are made of a more rigid material, preferably a polymeric material similar to that used for the backing ring.

According to the preferred embodiment, the first circumference is sized to receive a 4 inch pipeline and the second circumference is sized to receive a 3 inch pipeline. The opening of the first insert is sized to receive a 2 inch pipeline while the opening of the second insert is sized to receive a 1½ inch pipeline. A single penetration fitting having a sleeve of this design can receive four different sizes of pipeline.

A plurality of circumferential clamps such as radiator clamps or hose clamps are provided to effect the various seals to the sleeve. Such clamps are well known in the art and generally include a circular band in which the circumference can be adjusted by turning a screw or bolt located on the band. Referring back to FIG. 2, a first hose clamp 46 is provided at the first circumference to seal the sleeve against a large diameter pipe. The hose clamp can be tightened with a tool such as a wrench or screwdriver to seal the sleeve against the pipeline. A second hose clamp 47 and a third hose

clamp 48 are provided next to one another at the second circumference to seal the sleeve against either an intermediate diameter pipeline or one of the inserts. A fourth hose clamp 49 and a fifth hose clamp 51 (FIG. 3) are provided to clamp the opening of the first and second inserts around small diameter pipelines.

A plurality of circumferential beads 52 running around the sleeve above each hose clamp help to keep the hose clamps in place at their respective points along the sleeve. The beads are also useful in that they can be used as guides for trimming from the boot any portion of the sleeve that will not be used. For example, if the boot is used to seal a large diameter pipeline, the portion of the sleeve above the bead at the first hose clamp can be trimmed such as with a utility knife.

The stepped sleeve design and inserts make the penetration fitting capable of accommodating a number of different piping configurations. Just a few of the many different piping configurations are illustrated in FIGS. *4a–4d*. In FIG. *4a*, the penetration fitting 10 is shown installed on a system with a coaxial pipeline in which an outer pipeline 56 is provided with a 4 inch diameter and an inner pipeline 57 is provided with a 3 inch diameter. The outer pipeline is sealed to the sleeve at the first circumference 36 by the first hose clamp 46. The inner pipeline is sealed to the sleeve by the second hose clamp 47 at the second circumference 37. The portion of the sleeve above the second hose clamp has been cut away in this installation.

According to FIG. *4b*, the penetration fitting 10 is shown installed on a second coaxial pipeline configuration in which an outer pipeline 58 is provided with a 3 inch diameter and an inner pipeline 59 is provided with a 2 inch diameter. The outer pipeline is sealed at the second circumference 37 with the second hose clamp 47. The first insert 38 is sealed to the second circumference with the third hose clamp 48 and the inner pipeline is sealed to the opening 40 of the first insert by the fourth hose clamp 49.

Referring to FIG. 4c, the penetration fitting is configured as installed on yet another coaxial pipeline configuration. An outer pipeline 61 is provided with a 4 inch diameter and is sealed at the first circumference 36 by the first hose clamp 46. The first insert 38 is sealed to the second circumference 37 by the second hose clamp 47. The portion of the sleeve above the second hose clamp has been cut away for this installation. An inner pipeline 62 with a 2 inch diameter is sealed at the opening 40 of the first insert by the fourth hose clamp 49.

Referring to FIG. *4d*, yet another piping configuration is illustrated. Here a pipeline 63 with a 3 inch diameter is sealed to the sleeve at the second circumference 37 with the second hose clamp 47. For this installation the portion of the sleeve above the second hose clamp has been cut away.

Still other configurations are possible with the penetration fitting of the present invention. A single penetration fitting can be used to accommodate pipelines having diameters of 4 inches, 3 inches, 2 inches and 1½ inches. The same penetration fitting can also accommodate coaxial pipelines in which the inner and outer pipeline diameters are (expressed as outer diameter in inches × inner diameter in inches): 4×3; 4×2; 4×1½; 3×2; and 3×1½. The penetration fitting can also be used with either rigid or flexible pipelines.

Another embodiment of the present invention is illustrated in FIGS. 5, 6 and 7. This is presently the most preferred embodiment. According to this embodiment as illustrated in FIG. 5, a penetration fitting 110 is attached to the wall 12 of the containment box. The penetration fitting includes a flexible boot 116 (also see FIG. 6) with a sealing flange 117 that seals the flexible boot against the inside surface of the wall of the containment box. The general shape of the flexible boot is identical to the previous embodiment in that it includes a return bend 122 and a sleeve section 123 with a first circumference 136, a second circumference 137 and an insert 38. First, second third and fourth hose clamps 46, 47, 48, 49 are also provided.

Also like the prior embodiment, the heads of a plurality of bolts 126 are embedded within a ring portion 120 of a backing ring 124. Preferably, the bolts are embedded in hexagonal holes in the ring portion and sealed with an epoxy or a sealer such as silicone 127. One important difference in this embodiment over the prior embodiment is that rather than including bolts with shafts threaded their entire lengths, the shafts include a smooth shoulder 128 adjacent the head which extends into an outer threaded stud 125 opposite the head.

Another difference is the inclusion of a number of lips 151, each with a chamfered edge which circumferentially surrounds each of the sealing flange holes 130 on the surface 152 of the sealing flange (FIGS. 5 and 6). The lips mate with a plurality of counter bored holes 132 on a compression ring 131, each of the counter bored holes including each having a similarly chamfered edge. In the most preferred embodiment, the sealing flange holes are slightly smaller than the diameter of the shoulders of the bolts. For ¼ inch diameter bolts, the holes in the sealing flange are preferably 0.010 inch smaller in diameter. It is also preferred that when the penetration fitting is installed, the shoulder portion of each of the bolts should extend up to at least the tops of the lips on the sealing flange holes. It should be noted that even with such tolerances, a single size penetration fitting can fit a number of different containment boxes having different wall thicknesses as the width of the backing ring prevents the nuts 133 from bottoming-out on the threaded portions of the bolts during installation.

According to this embodiment, a particularly reliable seal among the components is achieved when the plurality of nuts are tightened down on the studs. The tightening of the nuts not only presses the sealing flange against the inside surface of the wall of the containment box by sandwiching the sealing flange and the wall between the backing ring and the compression ring, it also helps to seal against leakage which may occur at the bolts. This is accomplished by the cooperation between the lips on the sealing flange and the counter bored holes of the compression ring whereby the counter bored holes press the lips of the sealing flange against the shoulder portions of the bolts. Without such a design, in order to prevent leakage at the bolts, a second gasket such as that illustrated in the embodiment of FIG. 2 is required. In the prior art, leakage at the bolts generally prevented the mounting of a flexible boot to the inside wall of the containment box.

Another advantage to the use of the penetration fitting of the present invention is that the flexible boot permits great flexibility in the joint between the wall of the containment box and the pipeline penetrating the box. For example, as shown in FIG. 8, a penetration fitting 110 with a flexible boot 116 is illustrated in an installation where the center axis 153 of the pipeline 59 does not coincide with the center axis 154 of the entry hole through the wall 12 of the box. Here, a penetration fitting with a sealing flange approximately seven inches in diameter designed for up to a four inch pipeline with an entry hole of about 6 inches, is fitted with a two inch pipeline. By using the design of the present invention, an offset between the center axes of the pipeline and the entry

hole is permitted without compromising the integrity of the seal. For an installation with the penetration fitting described above fitted for a three inch pipeline, an offset of ¾ inch is permitted.

Furthermore, the flexible boot permits the pipeline to enter the box at a broad range of angles. This is in large part due to the low profile of the boot. In FIG. 9, a penetration fitting 110 with a flexible boot 116 and a two inch pipeline 59 attached to the flexible boot is shown flexed to an angle of about 9½ degrees from a line perpendicular to the wall of the box. For a four inch pipeline, an angle of up to about 45 degrees from perpendicular is permitted without compromising the integrity of the seal.

Another important feature of the present invention is that if the boot of a penetration fitting were to crack or tear, a new boot can be installed without excavating the ground around the containment box. First the primary pipeline is disconnected from the equipment inside the containment box. Then the nuts and the compression ring are removed from the penetration fitting. The damaged boot is removed and a new boot is placed over the pipeline such that the holes in the sealing flange fit over the studs of the existing backing ring. The compression ring and nuts are then reinstalled to seal the new boot against the wall of the containment box. There is generally no need to replace the gasket. A hose clamp is placed around the sleeve and tightened to seal the boot to the pipeline. The primary pipeline can then be reconnected to the equipment in the box with minimal downtime. Such a simple method for replacing a boot is impossible with prior art penetration fittings which are installed from the outside of the box.

Yet another advantage of the use of an embodiment such as that illustrated in FIG. 4*b* is that the use of the insert simplifies assembly of the piping system. The flexible boot of the penetration fitting can first be fastened to the box as set forth above. The insert 38 can then be placed at an appropriate point on the inner pipeline 59 and any fitting (not shown) that is to be placed on the inner pipeline can be attached before the pipeline is set in place. The pipeline can then be inserted into the boot, the second hose clamp 47 can be tightened against the outer pipeline 58, the insert can be slid along the inner pipeline until it rests within the sleeve of the boot, the third hose clamp 48 can be tightened to the insert and the fourth hose clamp 49 can be tightened to fasten the inner pipeline to the boot. For coaxial pipelines that require special equipment to attach a fitting to the inner pipeline, it can greatly simplify assembly if the fitting is attached to the end of the pipeline before the pipeline is placed in the box.

The use of the insert also simplifies the later replacement of the boot if the boot is ever damaged. In order to replace a damaged boot, first the inner pipeline is disconnected from any equipment in the box. Then the nuts and compression ring are removed along with the second and third hose clamps 47 and 48. The inner and outer pipelines can be left in place with the insert attached and the boot can be pulled over the pipeline including any fitting that may be attached to the inner pipeline. A new boot can then be pulled over the pipeline and sealed as set forth above. Without an insert, it can be difficult to pull a new boot over the pipeline, especially if the inner pipeline includes a permanently mounted fitting.

Still another advantage of the penetration fitting of the present invention is that the flexible boot permits the fitting to be installed on a slightly curved wall without the use of any special adaptors. According to FIG. 10, a penetration fitting 110 with a flexible boot 116 is shown attached to a containment box with a curved wall 112. Not only can the flexible boot be easily flexed to conform to the curvature of the wall, but since the ring portion 120 of the backing ring 124 and the compression ring 131 are also made of a somewhat resilient material, they too can conform to the curvature of the wall. The preferred material for these components is an acetyl copolymer sold under the name Celcon™. This is also the preferred material for the ring portion of the backing ring, the compression ring and the structural rings of the inserts. A penetration fitting with a seven inch flange and designed for up to a four inch pipeline can be mounted on a cylindrical wall having a radius of curvature greater than about 10 inches without the need for special fittings as are generally required for prior art penetration fittings. For walls having a smaller radius of curvature, a dished backing ring with a similarly dished compression ring can be provided for use with the same flexible boot described above.

What is claimed is:

1. A penetration fitting for forming a seal between a pipeline and a wall having an inside surface and an outside surface, the penetration fitting comprising:

a backing ring comprising a ring portion and a plurality of studs extending from the ring portion, the backing ring for placement against the outside surface of the wall and the studs for extending through the wall, the studs including a first smooth shoulder portion proximate the ring portion and a second threaded portion distal the ring portion;

a flexible boot comprising:

a sleeve for receiving the pipeline; and

a sealing flange including a first face for placement against the inside surface of the wall, a second face opposite the first face, a plurality of apertures extending between the first and second faces for receiving the plurality of studs, and a plurality of lips extending circumferentially around each aperture;

a clamp for sealing the sleeve of the flexible boot to the pipeline;

a compression ring defining a plurality of holes for receiving the plurality of studs, each hole including a counter bore for mating with the lips of the sealing flange; and

a plurality of nuts for cooperating with the studs to press the sealing flange between the compression ring and the inside surface of the wall.

2. The penetration fitting of claim 1 wherein the flexible boot further comprises a return bend.

3. The penetration fitting of claim 1 wherein the flexible boot further comprises a plurality of stepped openings for receiving a plurality of different sizes of pipes.

4. The penetration fitting of claim 3 further comprising an insert for cooperating with an opening to receive yet another different size of pipe.

5. The penetration fitting of claim 1 wherein the backing ring and the compression ring are made of a deformable material that permits the fitting to be installed on a curved wall.

* * * * *

US005988698A

United States Patent [19]

Bravo et al.

[11] Patent Number: 5,988,698

[45] Date of Patent: *Nov. 23, 1999

[54] **FLEXIBLE PENETRATION FITTING**

[75] Inventors: Sergio M. Bravo, 2872 Tigertail Dr., Los Alamitos, Calif. 90720; Don K. Mukai, Pasadena, Calif.

[73] Assignees: Sergio M. Bravo; S. Bravo Systems, Inc., both of Buena Park, Calif.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).
This patent is subject to a terminal disclaimer.

[21] Appl. No.: 09/081,165

[22] Filed: May 18, 1998

Related U.S. Application Data

[63] Continuation of application No. 08/889,900, Jul. 8, 1997, Pat. No. 5,826,919.

[51] Int. Cl.[6] F16L 3/04

[52] U.S. Cl. 285/139.2; 285/139.3; 285/148.25; 285/192; 285/236

[58] Field of Search 285/48, 49, 50, 285/205, 206, 229, 226, 236, 308, 368, 192, 139.2, 137.1, 139.3, 142.1, 148.25

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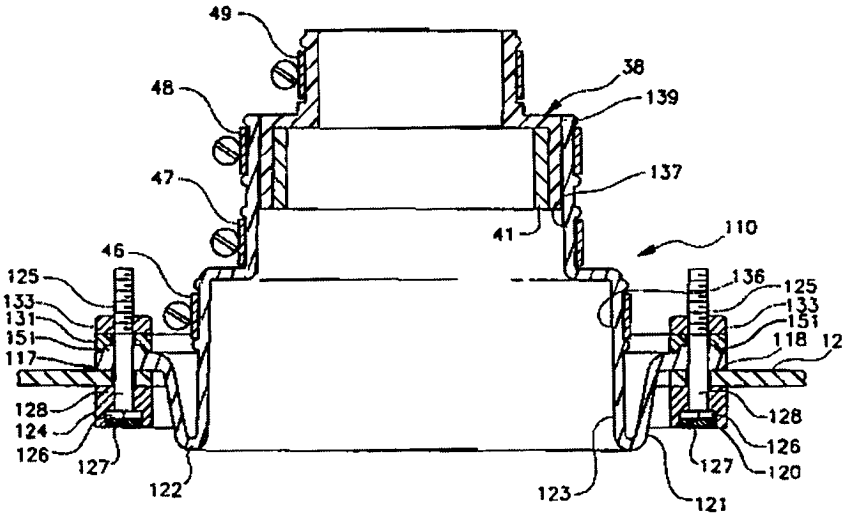
Primary Examiner—Dave W. Arola
Attorney, Agent, or Firm—Christie, Parker & Hale, LLP

[57] **ABSTRACT**

A flexible penetration fitting is provided for sealing the hole through which a pipeline penetrates a wall of an underground containment box. The penetration fitting includes a flexible boot with a sealing flange for providing a first seal against the inside wall of the box. The sealing flange is held against the wall by a backing ring placed against the outside wall of the box. The backing ring includes a plurality of studs extending through the wall and into the box. A compression ring with a plurality of holes is placed over the sealing flange with the studs of the backing ring extending though the holes. A plurality of nuts are threaded to the studs to hold the sealing flange firmly against the inside wall of the box. The flexible boot also includes a sleeve for providing a second seal against the outside surface of the pipeline. The sleeve is stepped with different sized openings so as to be able to receive different sizes of pipelines. A hose clamp placed around the sleeve at the appropriate sized opening seals the sleeve against the pipeline.

5 Claims, 10 Drawing Sheets



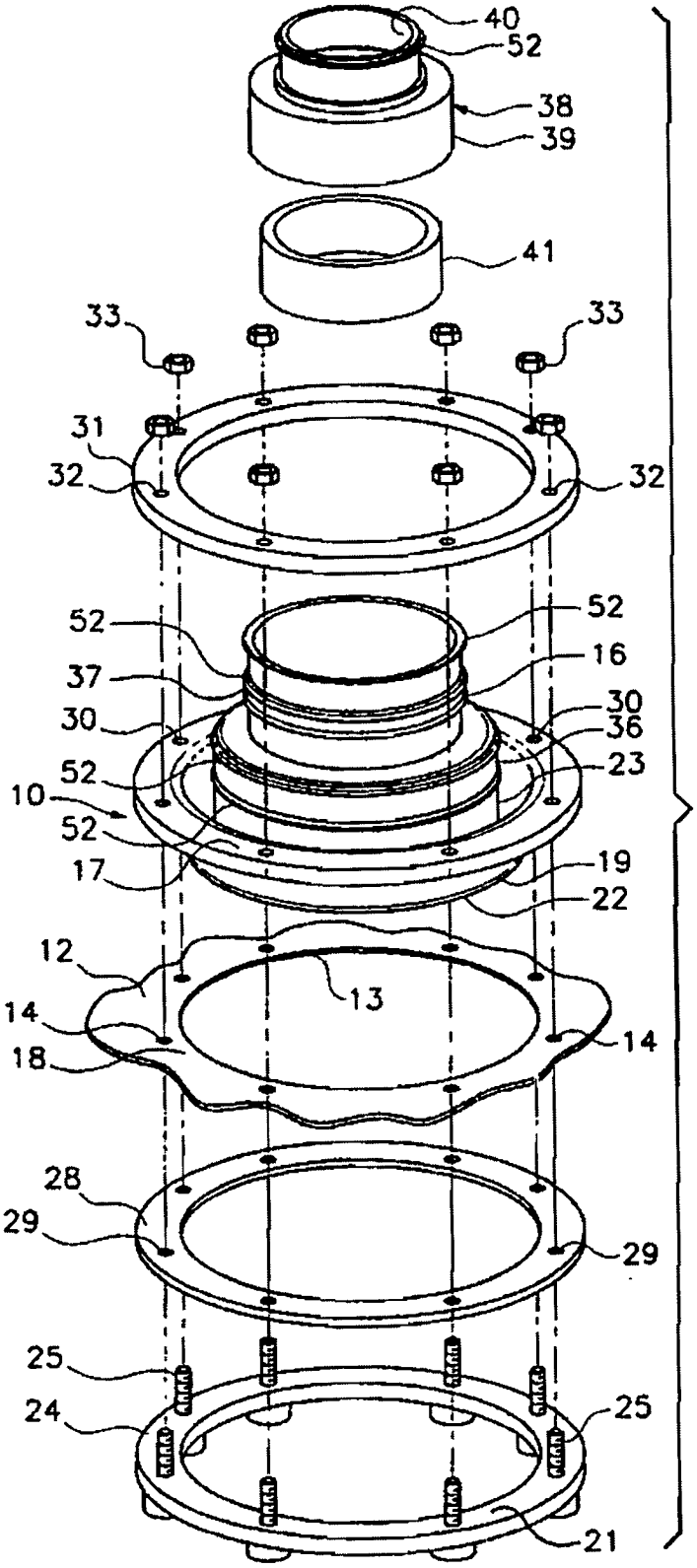

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FIG. 1

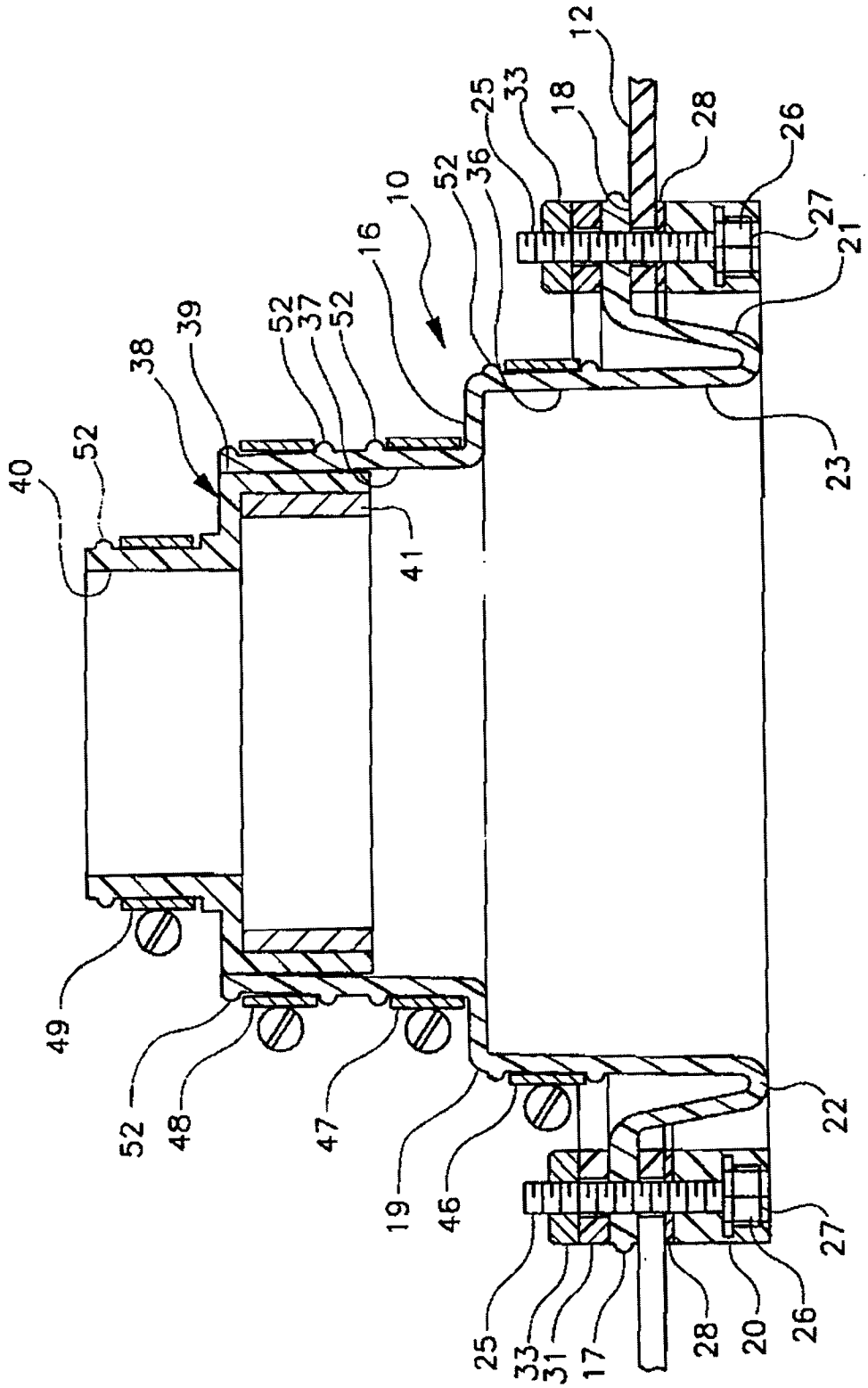
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FIG. 2

FIG.3

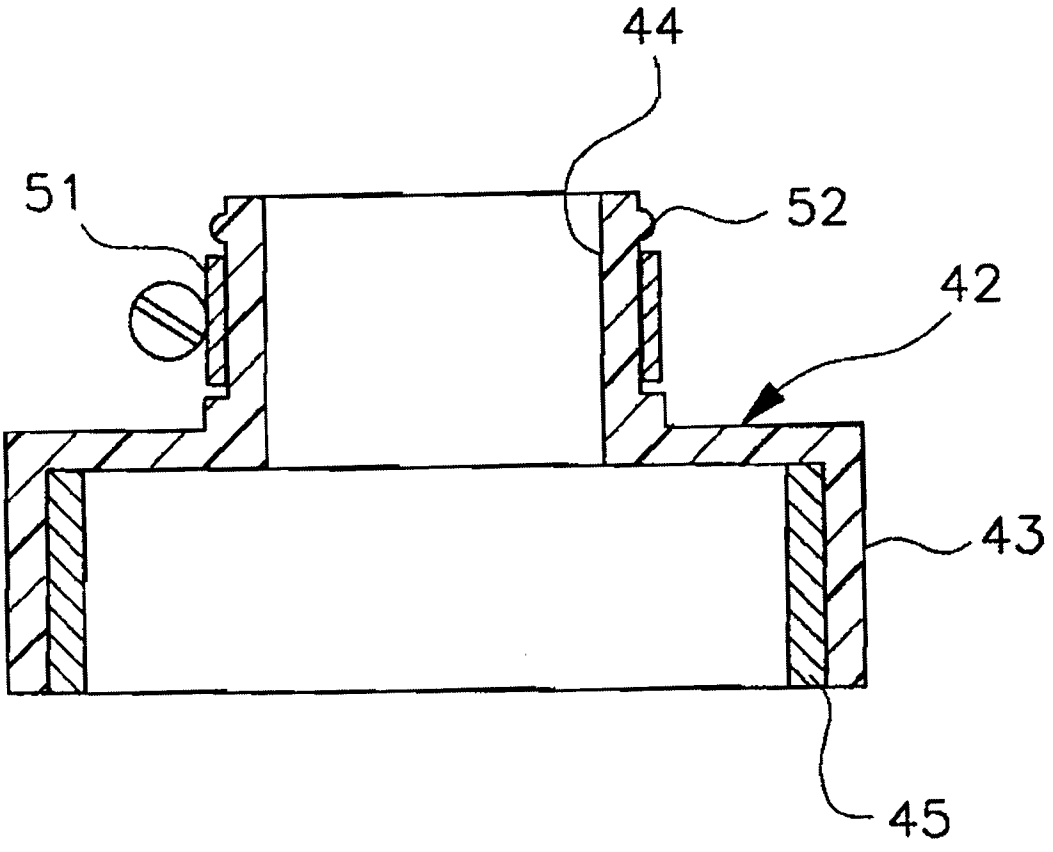

FIG.4a

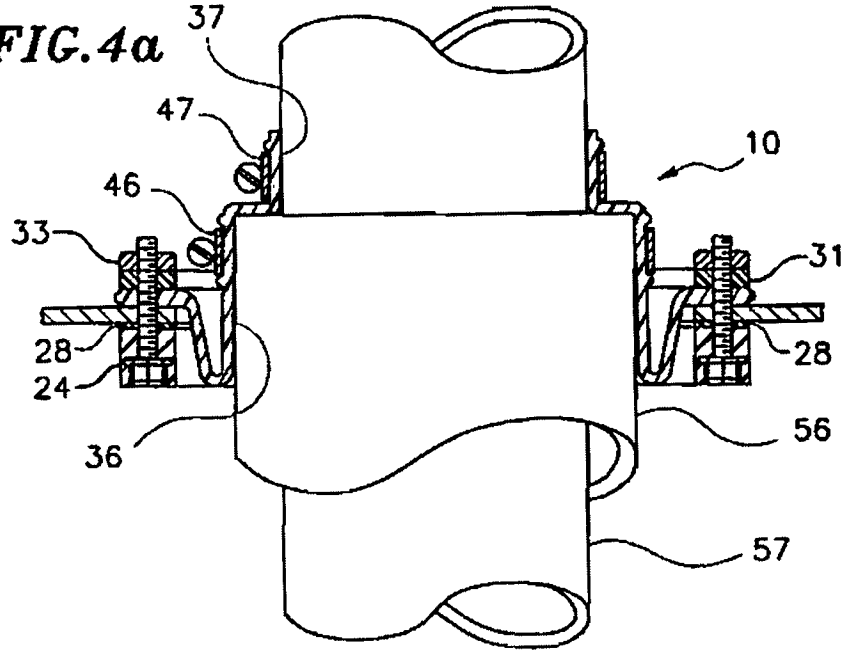
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FIG.4b

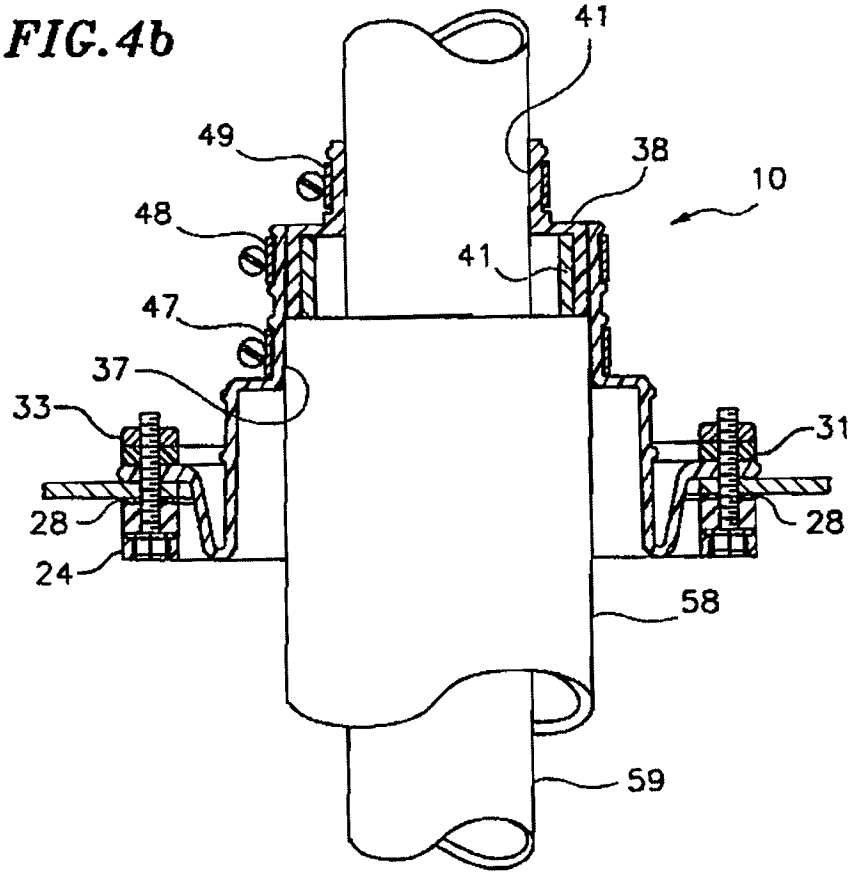
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FIG. 4c

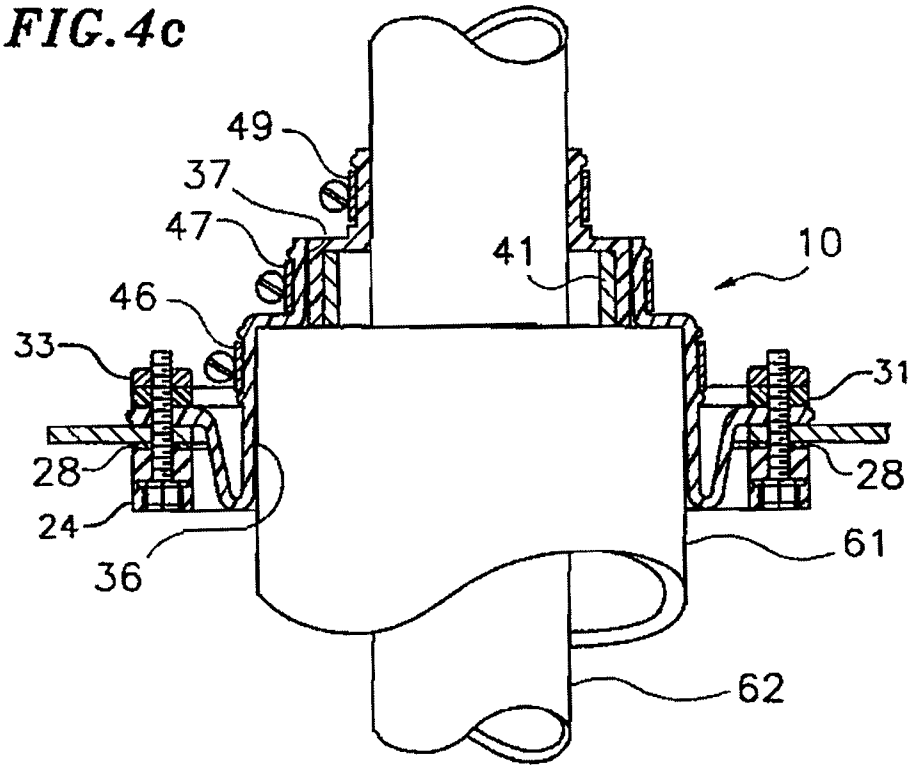

FIG. 4d

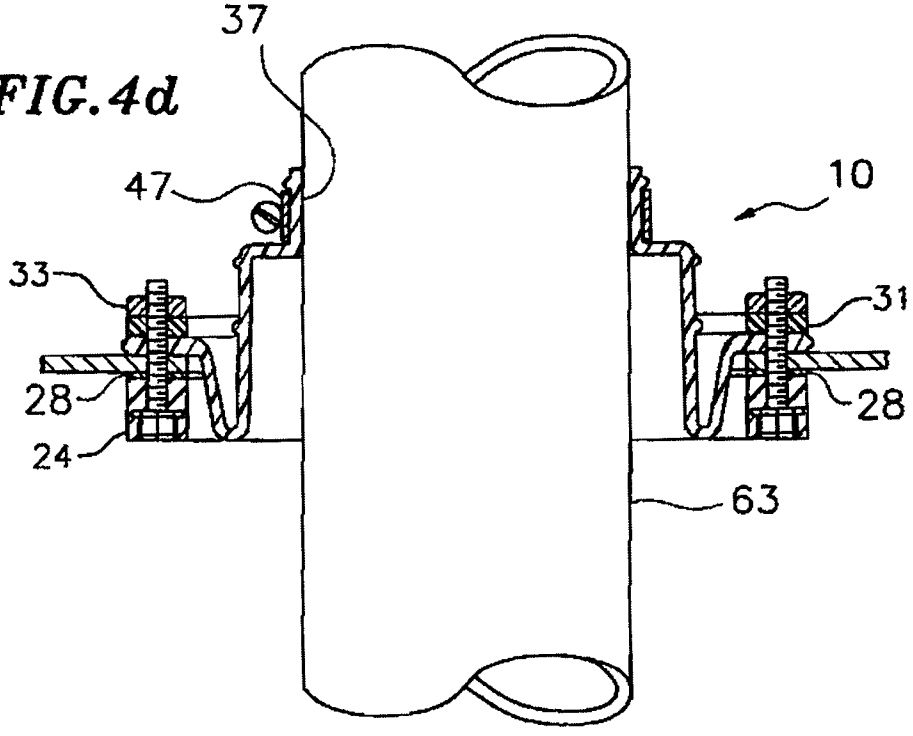

FIG.5

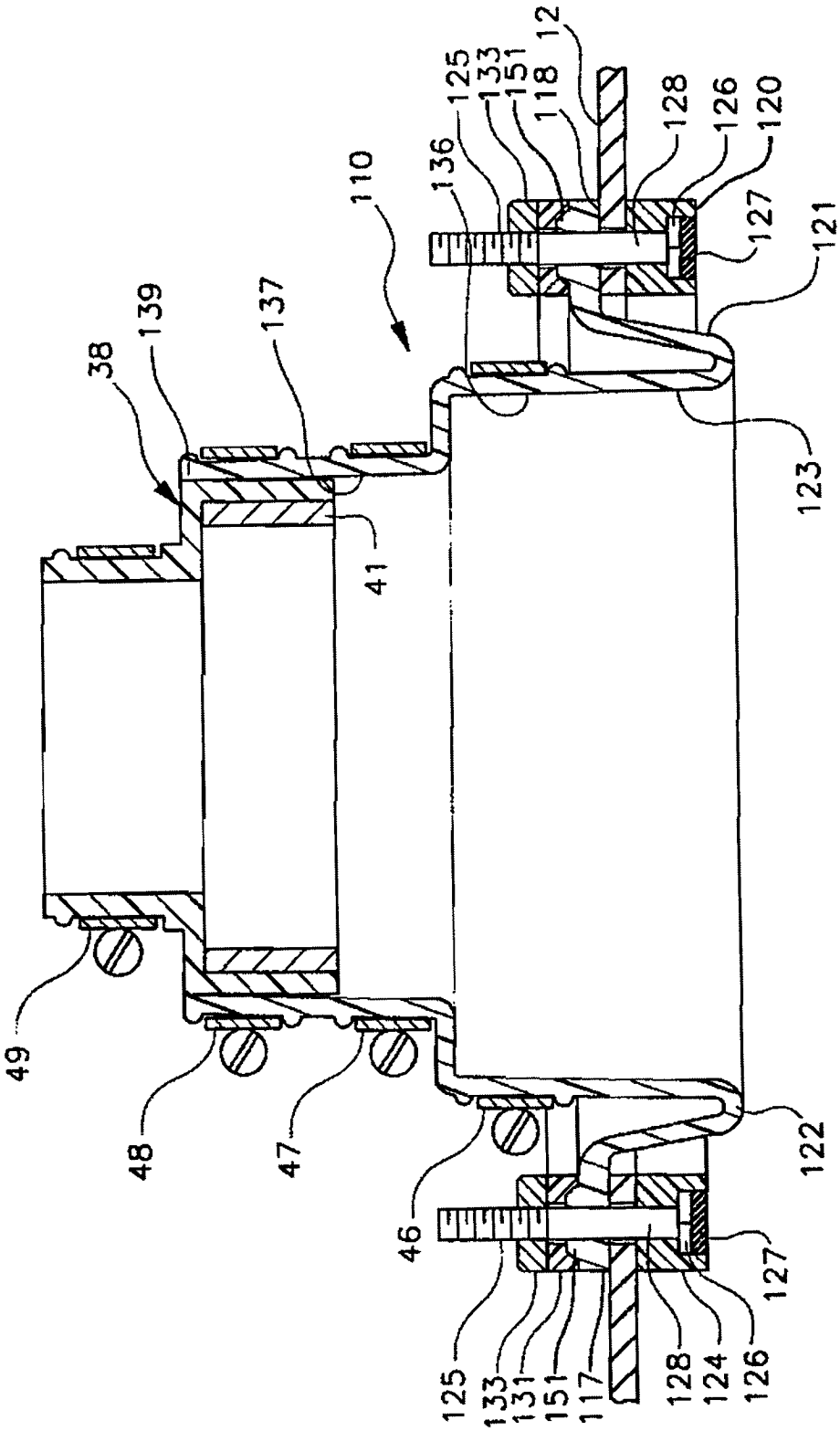
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FIG. 6

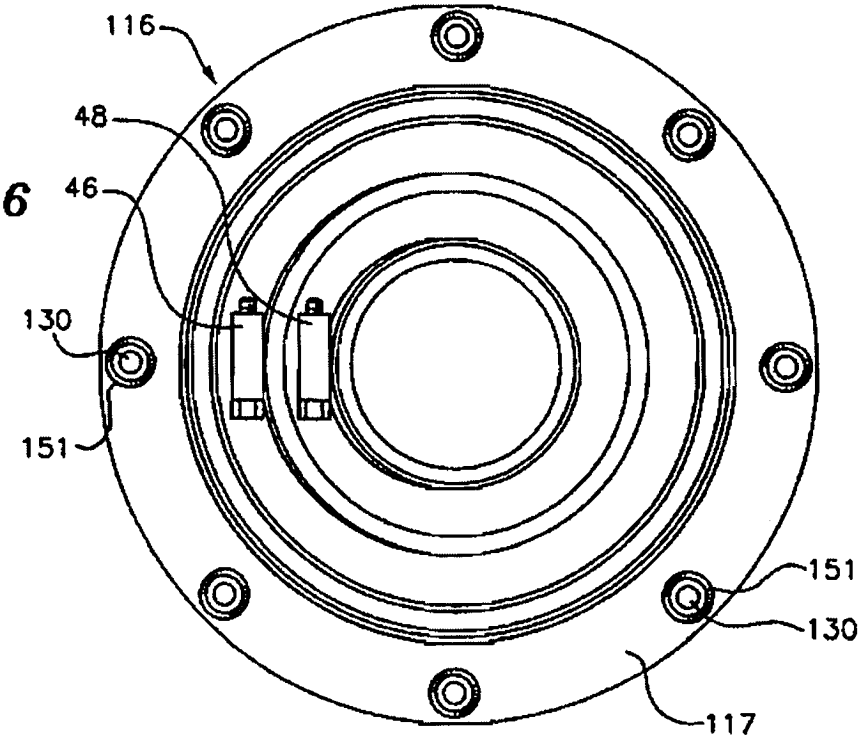


FIG. 7

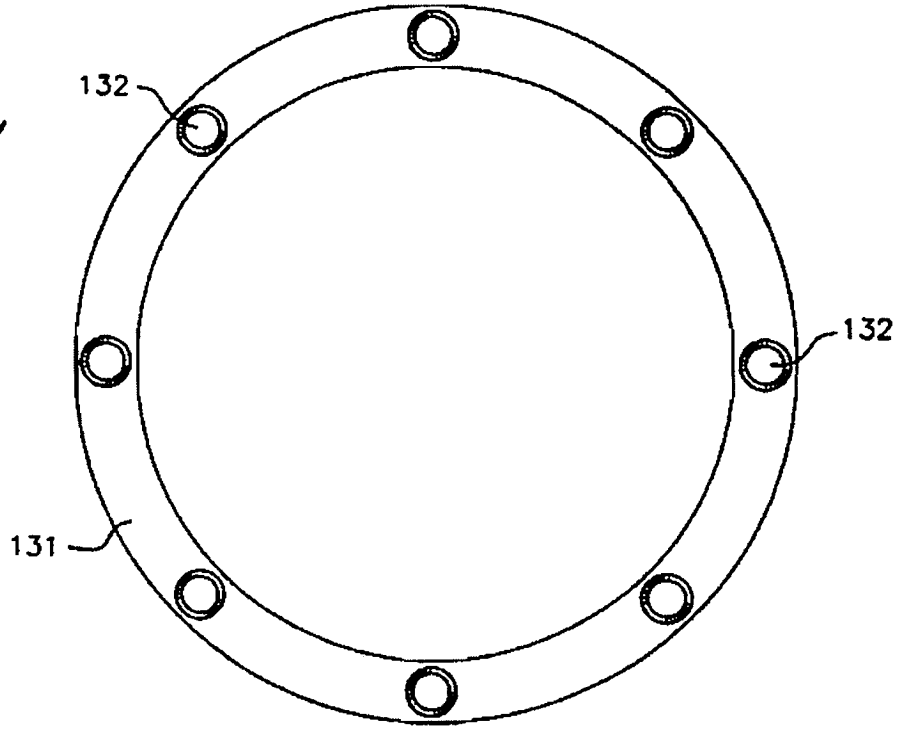


FIG.8

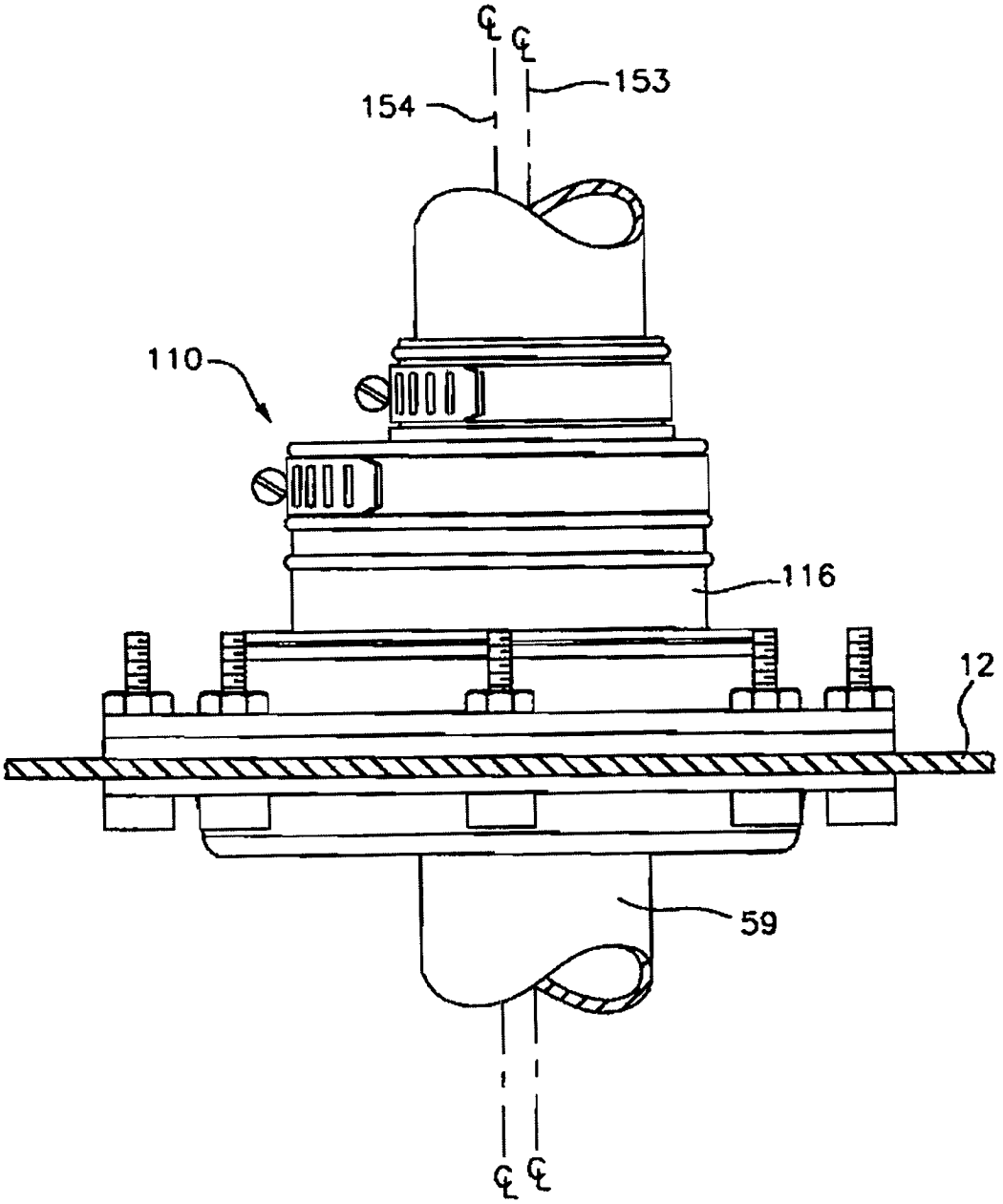


FIG.9

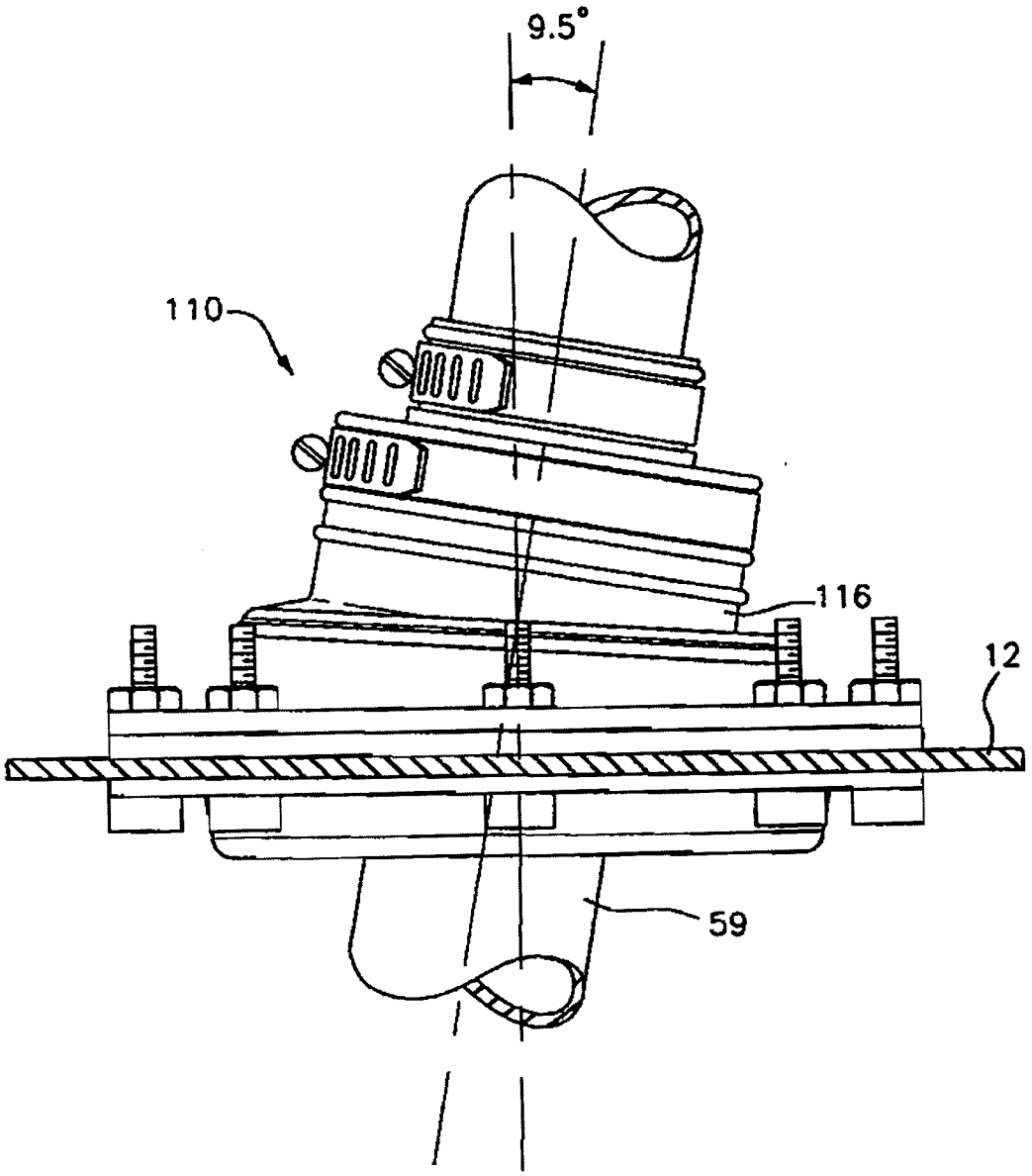
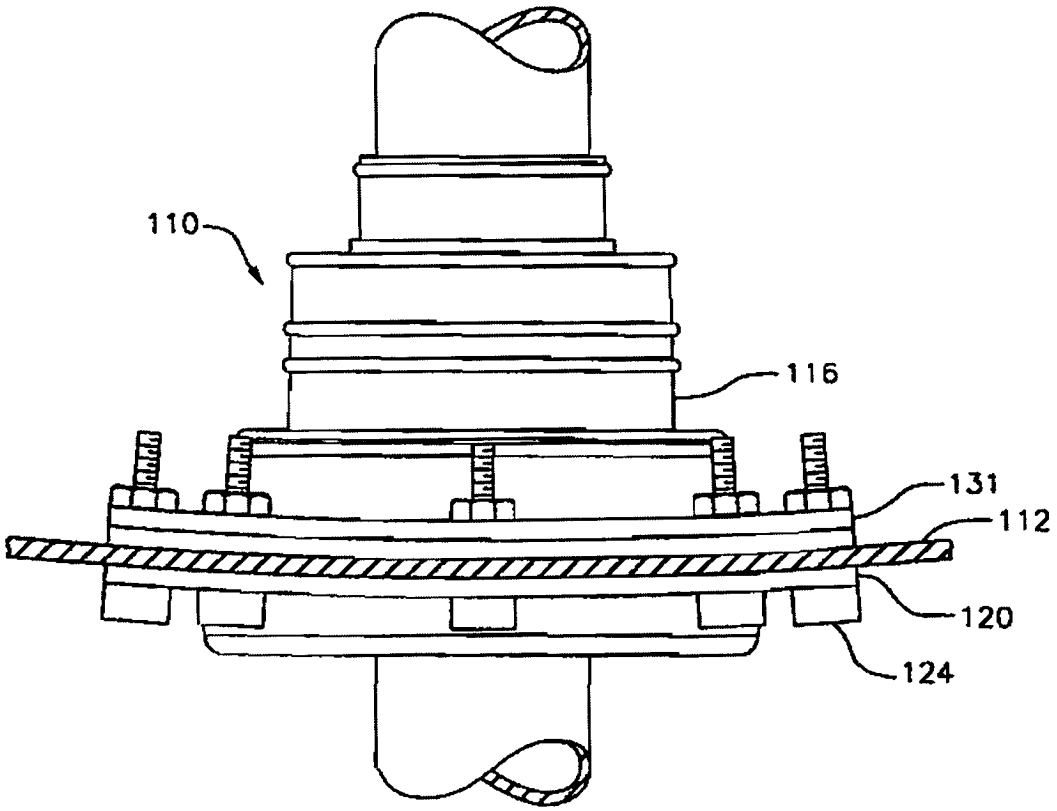


FIG. 10



FLEXIBLE PENETRATION FITTING

CROSS REFERENCE TO RELATED APPLICATIONS

The present invention is a continuation of application Ser. No. 08/889,900, now U.S. Pat. No. 5,826,919, filed Jul. 8, 1997.

FIELD OF THE INVENTION

The present invention relates to a flexible penetration fitting for use with a secondary containment box. More particularly, it relates to a universal penetration fitting that can be used with a broad range of sizes of flexible or rigid pipeline including various configurations of coaxial pipelines. The penetration fitting is also simple to replace in the event it becomes damaged after installation.

BACKGROUND OF THE INVENTION

For several years there has been a growing awareness of air and water pollution problems caused by leaking liquids such as gasoline that flow through buried pipelines such as those present at gasoline service stations. As a result, secondary containment systems have been developed for these systems. A secondary containment system typically includes a primary pipeline in which a product such as gasoline flows from an underground storage tank to a product dispenser. The system also includes a secondary pipeline that surrounds the primary pipeline. The purpose of the secondary pipeline is to contain any fluid that may leak from a damaged primary pipeline, and prevent the fluid from contaminating the surrounding ground. The secondary pipeline is generally monitored for fluid collection so that any leak in the primary pipeline can be repaired promptly.

Fittings known as bulkhead fittings or penetration fittings are generally used in combination with secondary containment systems to permit a buried pipeline to penetrate the wall or bulkhead of a containment box. Containment boxes are liquid-tight boxes associated with connections in the primary pipeline. For example, containment boxes are often provided under product dispensers, at product pumps, or at other junctions in the primary pipeline to contain any product that may leak or spill from the primary pipeline associated with such equipment. A penetration fitting prevents any such liquid that is collected in a containment box from contaminating the ground by sealing the hole in the wall through which the pipeline penetrates the wall of the containment box.

Many different types of penetration fittings have been developed. A popular type of penetration fitting is a boot made from a resilient elastomeric material which imparts flexibility to the joint between the pipeline and the containment box. One such a boot is disclosed at FIG. 22 of U.S. Pat. No. 5,297,896 to Webb. According to the Webb patent the containment box includes a pipe entry hole through which the pipeline extends. Surrounding the entry hole are a plurality of stud holes which assist in fastening the boot to the wall of the containment box. The boot is installed from the outside of the containment box and includes a flexible sleeve section extending from a sealing flange. While the sealing flange is located outside the box, the sleeve extends through the pipe entry hole and into the box. The sealing flange includes integral studs that extend through the stud holes of the containment box. The studs also extend through a plurality of holes in a compression ring located in the box. Nuts are threaded over the studs to press on the compression ring which in turn pulls the sealing flange against the outer surface of the wall of the containment box to effect the seal. The pipeline extends into the box through the flexible sleeve portion of the boot and is sealed to the sleeve portion with a hose clamp.

A similar penetration fitting is sold by Environ Products, Inc. of Lionville, Pa. This penetration fitting additionally includes a return bend in the flexible tube portion such that the sleeve is made of a flexible tube that first extends away from the containment box and then turns inward on itself to extend through the hole in the wall of the containment box. Such a return bend provides further flexibility to the boot.

Fittings with boot portions that are stepped to accommodate two different sizes of pipes are also known. Such penetration fittings allow a single fitting to seal against two different sizes of pipeline where the two pipelines are provided in a coaxial arrangement. Such penetration fittings can also include inserts that can be clamped in place within the flexible tube to allow a single penetration fitting to accommodate different sizes of pipelines. Examples of such penetration fittings and inserts are those sold by Total Containment, Inc. of Exton, Pa.

Because prior art penetration fittings include a boot made from a resilient material, the boot can periodically crack or tear. If the integrity of a penetration fitting is compromised due to a crack or tear in the boot, it must be replaced. However, one important problem with prior art penetration fittings is that they generally cannot be easily removed and reinstalled. Because such a penetration fitting is installed on the containment box from the outside, excavation is required to put a new penetration fitting in place. Such excavation can lead to extensive maintenance costs as well as prolonged downtime of a service station.

SUMMARY OF THE INVENTION

The penetration fitting of the present invention is used for forming a seal between a pipeline and a wall of a containment box. An optional gasket is placed on the outside surface of the wall of the box. A backing ring is also provided outside of the box with a plurality of studs extending from it. The studs are oriented to extend through a plurality of holes in the gasket and into the box. A flexible boot is provided with a sealing flange for placement against the inside surface of the wall. The sealing flange includes a plurality of holes through which the studs extend.

A compression ring is provided over the sealing flange inside the box. The compression ring also has a plurality of holes through which the studs extend. The boot is sealed to the inside wall of the box at the sealing flange by threading nuts to the studs which press the compression ring against the sealing flange and press the sealing flange against the wall. The optional gasket between the backing ring and wall of the box provides further sealing in the event there is leakage through the holes in the sealing flange.

Extending from the sealing flange is a sleeve for receiving the pipeline. In the preferred embodiment the sleeve includes a return bend which provides added flexibility to the boot. The preferred embodiment also includes a stepped sleeve configuration in which the circumference of the sleeve decreases in increments along its length. This configuration permits the boot to accommodate a number of different sizes of pipelines including coaxial pipelines having inner and outer pipelines. A particular pipeline is sealed to the sleeve by a hose clamp at the appropriate location along the length of the sleeve where the pipeline best fits. Any portion of the sleeve smaller than the pipeline can be removed easily with a utility knife.

An important benefit of the penetration fitting of the present invention is that once the backing ring is in place, the boot can be installed entirely from inside the containment box. This permits a damaged boot to be replaced without the need for excavating around the containment box.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features, aspects, and advantages of the present invention will be more fully understood when considered with respect to the following detailed description, appended claims, and accompanying drawings where:

FIG. 1 is an exploded perspective view of a flexible penetration fitting of the present invention;

FIG. 2 is a sectional elevation view of the penetration fitting of FIG. 1;

FIG. 3 is a sectional elevation view of an alternative insert for use with the penetration fitting of FIG. 1;

FIGS. *4a–4d* are sectional elevation views of the penetration fitting of FIG. 1 when used in various pipeline configurations;

FIG. 5 is a sectional elevation view of another embodiment of the invention;

FIG. 6 is a top plan view of the flexible boot of FIG. 5;

FIG. 7 is a bottom plan view of the compression ring of FIG. 5;

FIGS. 8 and 9 are elevation views of the penetration fitting of FIG. 5 illustrating the flexibility of the boot when installed; and

FIG. 10 is an elevation view partly in section illustrating the penetration fitting of FIG. 5 installed on a curved wall.

DETAILED DESCRIPTION

According to the present invention, a flexible penetration fitting **10** as illustrated in FIGS. 1 and 2 is provided to seal a wall **12** of an underground containment box at the point where a pipeline (not shown) penetrates the wall. The containment box includes a first pipe entry hole **13** through which the pipe extends and a plurality of mounting holes **14** arranged around the entry hole for mounting the penetration fitting to the containment box.

The penetration fitting includes a flexible boot **16** made of a resilient oil resistant elastomeric material. The boot includes a ring-shaped sealing flange **17** for providing a seal against the inside surface **18** of the containment box wall. The boot also includes an integral flexible tube portion **19** that extends from the sealing flange. In the preferred embodiment, a first outwardly extending portion **21** of the tube extends in an outward direction away from the containment box. The tube then forms a return bend section **22** where it turns back on itself in an inward direction and back into the containment box to form a sleeve section **23**. The sleeve section provides a sealing surface for sealing against the pipeline as will be discussed in further detail below.

The penetration fitting also includes a backing ring **24** provided outside the containment box. The backing ring includes a ring portion **20** with a plurality of studs **25** extending in a direction perpendicular to the plane of the ring portion. Preferably, eight studs are provided spaced equidistantly around the circumference of the backing ring. In the preferred embodiment the ring portion of the backing ring is made of a durable polymeric material with eight bolts **26** fastened to the backing ring by embedding their heads **27** within the backing ring. The threaded shafts of the bolts act as the studs for the backing ring. The backing ring is placed around the pipe entry hole outside the containment box with an optional gasket **28** between it and the wall. The studs of the backing ring extend through a plurality of holes **29** in the surface of the gasket, through the plurality of mounting holes in the wall of the box and into the box. The studs further extend through a plurality of holes **30** in the sealing flange of the boot.

A compression ring **31**, also with a plurality of holes **32** for cooperating with the plurality of studs is provided inside the containment box. The compression ring is preferably made of a fairly rigid material compared to that used for the flexible boot. While the compression ring may be made of metal, it is preferably made of a fairly rigid polymeric material such as that used for the ring portion of the backing ring. Eight nuts **33** are threaded to the studs and press the compression ring against the sealing flange to press the sealing flange against the inside wall of the containment box sealing the boot to the containment box.

The flexible sleeve of the boot is designed to receive a variety of different pipe sizes. This is achieved by a stepped configuration in the circumference of the sleeve. A first circumference **36** is provided on the sleeve at a point near the sealing flange. The first circumference is capable of receiving a first pipe with a relatively large diameter. As the sleeve extends away from the sealing flange, the first circumference necks down to a second circumference **37** for receiving a second pipe with an intermediate diameter.

In the preferred embodiment, the penetration fitting also includes a first insert **38** having an outside diameter **39** for cooperating with the second circumference of the sleeve. The outside diameter necks down to a narrower section with an inside opening **40** for receiving a third pipe with a relatively small diameter. A structural ring **41** made of a fairly rigid material is provided inside the first insert at the first diameter to prevent either the insert or the sleeve from collapsing when the insert is attached to the sleeve. A second insert **42** as illustrated in FIG. 3 is also provided similar to the first insert. The second insert has an outside diameter **43** for cooperating with the second circumference of the sleeve and an opening **44** for receiving a fourth pipe with a relatively small diameter different from the diameter of the opening of the first insert. Like the first insert, the second insert includes a structural ring **45** for preventing the insert or the sleeve from collapsing when attached to the sleeve. Preferably, the first and second inserts are made of a resilient elastomeric material similar to that used for the boot. The structural rings are made of a more rigid material, preferably a polymeric material similar to that used for the backing ring.

According to the preferred embodiment, the first circumference is sized to receive a 4 inch pipeline and the second circumference is sized to receive a 3 inch pipeline. The opening of the first insert is sized to receive a 2 inch pipeline while the opening of the second insert is sized to receive a 1½ inch pipeline. A single penetration fitting having a sleeve of this design can receive four different sizes of pipeline.

A plurality of circumferential clamps such as radiator clamps or hose clamps are provided to effect the various seals to the sleeve. Such clamps are well known in the art and generally include a circular band in which the circumference can be adjusted by turning a screw or bolt located on the band. Referring back to FIG. 2, a first hose clamp **46** is provided at the first circumference to seal the sleeve against a large diameter pipe. The hose clamp can be tightened with a tool such as a wrench or screwdriver to seal the sleeve against the pipeline. A second hose clamp **47** and a third hose

clamp 48 are provided next to one another at the second circumference to seal the sleeve against either an intermediate diameter pipeline or one of the inserts. A fourth hose clamp 49 and a fifth hose clamp 51 (FIG. 3) are provided to clamp the opening of the first and second inserts around small diameter pipelines.

A plurality of circumferential beads 52 running around the sleeve above each hose clamp help to keep the hose clamps in place at their respective points along the sleeve. The beads are also useful in that they can be used as guides for trimming from the boot any portion of the sleeve that will not be used. For example, if the boot is used to seal a large diameter pipeline, the portion of the sleeve above the bead at the first hose clamp can be trimmed such as with a utility knife.

The stepped sleeve design and inserts make the penetration fitting capable of accommodating a number of different piping configurations. Just a few of the many different piping configurations are illustrated in FIGS. 4*a*–4*d*. In FIG. 4*a*, the penetration fitting 10 is shown installed on a system with a coaxial pipeline in which an outer pipeline 56 is provided with a 4 inch diameter and an inner pipeline 57 is provided with a 3 inch diameter. The outer pipeline is sealed to the sleeve at the first circumference 36 by the first hose clamp 46. The inner pipeline is sealed to the sleeve by the second hose clamp 47 at the second circumference 37. The portion of the sleeve above the second hose clamp has been cut away in this installation.

According to FIG. 4*b*, the penetration fitting 10 is shown installed on a second coaxial pipeline configuration in which an outer pipeline 58 is provided with a 3 inch diameter and an inner pipeline 59 is provided with a 2 inch diameter. The outer pipeline is sealed at the second circumference 37 with the second hose clamp 47. The first insert 38 is sealed to the second circumference with the third hose clamp 48 and the inner pipeline is sealed to the opening 40 of the first insert by the fourth hose clamp 49.

Referring to FIG. 4*c*, the penetration fitting is configured as installed on yet another coaxial pipeline configuration. An outer pipeline 61 is provided with a 4 inch diameter and is sealed at the first circumference 36 by the first hose clamp 46. The first insert 38 is sealed to the second circumference 37 by the second hose clamp 47. The portion of the sleeve above the second hose clamp has been cut away for this installation. An inner pipeline 62 with a 2 inch diameter is sealed at the opening 40 of the first insert by the fourth hose clamp 49.

Referring to FIG. 4*d*, yet another piping configuration is illustrated. Here a pipeline 63 with a 3 inch diameter is sealed to the sleeve at the second circumference 37 with the second hose clamp 47. For this installation the portion of the sleeve above the second hose clamp has been cut away.

Still other configurations are possible with the penetration fitting of the present invention. A single penetration fitting can be used to accommodate pipelines having diameters of 4 inches, 3 inches, 2 inches and 1½ inches. The same penetration fitting can also accommodate coaxial pipelines in which the inner and outer pipeline diameters are (expressed as outer diameter in inches x inner diameter in inches): 4x3; 4x2; 4x1½; 3x2; and 3x1½. The penetration fitting can also be used with either rigid or flexible pipelines.

Another embodiment of the present invention is illustrated in FIGS. 5, 6 and 7. This is presently the most preferred embodiment. According to this embodiment as illustrated in FIG. 5, a penetration fitting 110 is attached to the wall 12 of the containment box. The penetration fitting includes a flexible boot 116 (also see FIG. 6) with a sealing flange 117 that seals the flexible boot against the inside surface of the wall of the containment box. The general shape of the flexible boot is identical to the previous embodiment in that it includes a return bend 122 and a sleeve section 123 with a first circumference 136, a second circumference 137 and an insert 38. First, second third and fourth hose clamps 46, 47, 48, 49 are also provided.

Also like the prior embodiment, the heads of a plurality of bolts 126 are embedded within a ring portion 120 of a backing ring 124. Preferably, the bolts are embedded in hexagonal holes in the ring portion and sealed with an epoxy or a sealer such as silicone 127. One important difference in this embodiment over the prior embodiment is that rather than including bolts with shafts threaded their entire lengths, the shafts include a smooth shoulder 128 adjacent the head which extends into an outer threaded stud 125 opposite the head.

Another difference is the inclusion of a number of lips 151, each with a chamfered edge which circumferentially surrounds each of the sealing flange holes 130 on the surface 152 of the sealing flange (FIGS. 5 and 6). The lips mate with a plurality of counter bored holes 132 on a compression ring 131, each of the counter bored holes including each having a similarly chamfered edge. In the most preferred embodiment, the sealing flange holes are slightly smaller than the diameter of the shoulders of the bolts. For ¼ inch diameter bolts, the holes in the sealing flange are preferably 0.010 inch smaller in diameter. It is also preferred that when the penetration fitting is installed, the shoulder portion of each of the bolts should extend up to at least the tops of the lips on the sealing flange holes. It should be noted that even with such tolerances, a single size penetration fitting can fit a number of different containment boxes having different wall thicknesses as the width of the backing ring prevents the nuts 133 from bottoming-out on the threaded portions of the bolts during installation.

According to this embodiment, a particularly reliable seal among the components is achieved when the plurality of nuts are tightened down on the studs. The tightening of the nuts not only presses the sealing flange against the inside surface of the wall of the containment box by sandwiching the sealing flange and the wall between the backing ring and the compression ring, it also helps to seal against leakage which may occur at the bolts. This is accomplished by the cooperation between the lips on the sealing flange and the counter bored holes of the compression ring whereby the counter bored holes press the lips of the sealing flange against the shoulder portions of the bolts. Without such a design, in order to prevent leakage at the bolts, a second gasket such as that illustrated in the embodiment of FIG. 2 is required. In the prior art, leakage at the bolts generally prevented the mounting of a flexible boot to the inside wall of the containment box.

Another advantage to the use of the penetration fitting of the present invention is that the flexible boot permits great flexibility in the joint between the wall of the containment box and the pipeline penetrating the box. For example, as shown in FIG. 8, a penetration fitting 110 with a flexible boot 116 is illustrated in an installation where the center axis 153 of the pipeline 59 does not coincide with the center axis 154 of the entry hole through the wall 12 of the box. Here, a penetration fitting with a sealing flange approximately seven inches in diameter designed for up to a four inch pipeline with an entry hole of about 6 inches, is fitted with a two inch pipeline. By using the design of the present invention, an offset between the center axes of the pipeline and the entry

hole is permitted without compromising the integrity of the seal. For an installation with the penetration fitting described above fitted for a three inch pipeline, an offset of ¾ inch is permitted.

Furthermore, the flexible boot permits the pipeline to enter the box at a broad range of angles. This is in large part due to the low profile of the boot. In FIG. **9**, a penetration fitting **110** with a flexible boot **116** and a two inch pipeline **59** attached to the flexible boot is shown flexed to an angle of about 9½ degrees from a line perpendicular to the wall of the box. For a four inch pipeline, an angle of up to about 45 degrees from perpendicular is permitted without compromising the integrity of the seal.

Another important feature of the present invention is that if the boot of a penetration fitting were to crack or tear, a new boot can be installed without excavating the ground around the containment box. First the primary pipeline is disconnected from the equipment inside the containment box. Then the nuts and the compression ring are removed from the penetration fitting. The damaged boot is removed and a new boot is placed over the pipeline such that the holes in the sealing flange fit over the studs of the existing backing ring. The compression ring and nuts are then reinstalled to seal the new boot against the wall of the containment box. There is generally no need to replace the gasket. A hose clamp is placed around the sleeve and tightened to seal the boot to the pipeline. The primary pipeline can then be reconnected to the equipment in the box with minimal downtime. Such a simple method for replacing a boot is impossible with prior art penetration fittings which are installed from the outside of the box.

Yet another advantage of the use of an embodiment such as that illustrated in FIG. *4b* is that the use of the insert simplifies assembly of the piping system. The flexible boot of the penetration fitting can first be fastened to the box as set forth above. The insert **38** can then be placed at an appropriate point on the inner pipeline **59** and any fitting (not shown) that is to be placed on the inner pipeline can be attached before the pipeline is set in place. The pipeline can then be inserted into the boot, the second hose clamp **47** can be tightened against the outer pipeline **58**, the insert can be slid along the inner pipeline until it rests within the sleeve of the boot, the third hose clamp **48** can be tightened to the insert and the fourth hose clamp **49** can be tightened to fasten the inner pipeline to the boot. For coaxial pipelines that require special equipment to attach a fitting to the inner pipeline, it can greatly simplify assembly if the fitting is attached to the end of the pipeline before the pipeline is placed in the box.

The use of the insert also simplifies the later replacement of the boot if the boot is ever damaged. In order to replace a damaged boot, first the inner pipeline is disconnected from any equipment in the box. Then the nuts and compression ring are removed along with the second and third hose clamps **47** and **48**. The inner and outer pipelines can be left in place with the insert attached and the boot can be pulled over the pipeline including any fitting that may be attached to the inner pipeline. A new boot can then be pulled over the pipeline and sealed as set forth above. Without an insert, it can be difficult to pull a new boot over the pipeline, especially if the inner pipeline includes a permanently mounted fitting.

Still another advantage of the penetration fitting of the present invention is that the flexible boot permits the fitting to be installed on a slightly curved wall without the use of any special adaptors. According to FIG. **10**, a penetration fitting **110** with a flexible boot **116** is shown attached to a containment box with a curved wall **112**. Not only can the flexible boot be easily flexed to conform to the curvature of the wall, but since the ring portion **120** of the backing ring **124** and the compression ring **131** are also made of a somewhat resilient material, they too can conform to the curvature of the wall. The preferred material for these components is an acetyl copolymer sold under the name Celcon™. This is also the preferred material for the ring portion of the backing ring, the compression ring and the structural rings of the inserts. A penetration fitting with a seven inch flange and designed for up to a four inch pipeline can be mounted on a cylindrical wall having a radius of curvature greater than about 10 inches without the need for special fittings as are generally required for prior art penetration fittings. For walls having a smaller radius of curvature, a dished backing ring with a similarly dished compression ring can be provided for use with the same flexible boot described above.

What is claimed is:

1. A penetration fitting for forming a seal between a pipeline and a wall having first and second surfaces, the penetration fitting comprising:

a backing ring comprising a ring portion and a plurality of studs extending from the ring portion, the backing ring for placement against the first surface of the wall and the studs for extending through the wall, each stud including a first smooth shoulder portion proximate the ring portion and a second threaded portion distal the ring portion;

a flexible boot comprising a sleeve for receiving the pipeline, a sealing flange including a face for placement against the second surface of the wall, a plurality of apertures, each aperture for receiving at least a portion of the smooth shoulder portion of one of the plurality of studs and a plurality of lips, each lip extending circumferentially around aperture;

a clamp for sealing the sleeve of the flexible boot to the pipeline;

a compression ring defining a plurality of holes for receiving the plurality of studs each hole including a counter bore for mating with a respective lip of the sealing flange; and

a plurality of nuts for cooperating with the studs to press the sealing flange between the compression ring and the second surface of the wall.

2. The penetration fitting of claim 1 wherein the flexible boot further comprises a return bend.

3. The penetration fitting of claim 1 wherein the flexible boot further comprises a plurality of stepped openings for receiving a plurality of different sizes of pipes.

4. The penetration fitting of claim 3 further comprising an insert for cooperating with an opening to receive yet another different size of pipe.

5. The penetration fitting of claim 1 wherein the backing ring and the compression ring are made of a deformable material that permits the fitting to be installed on a curved wall.

* * * * *

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(12) **United States Patent**
Daoud

(10) **Patent No.: US 6,353,184 B1**
(45) **Date of Patent: Mar. 5, 2002**

(54) **LOW PROFILE ADAPTER FOR VARIABLE SIZE HEAT SHRINK TUBING JOINT**

(75) Inventor: **Bassel Hage Daoud**, Parsippany, NJ (US)

(73) Assignee: **Avaya Technology Corp.**, Basking Ridge, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Aug. 11, 1999**

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(52) **U.S. Cl.** ..... **174/65 R**; 177/65 G; 177/151; 16/2.1

(58) **Field of Search** ..... 174/65 G, 151, 174/152 G, 153 G, 135, 65 R; 16/2.1, 2.2, 2.3; 285/139.2, 139.3, 148.25, 192; 248/56

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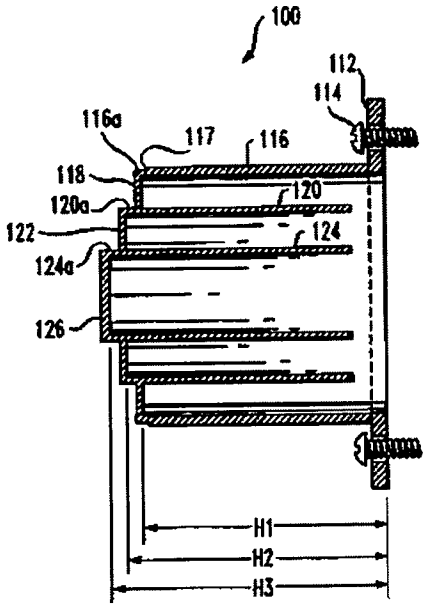
Primary Examiner—Dean A. Reichard
Assistant Examiner—Angel R. Estrada
(74) *Attorney, Agent, or Firm*—Duane, Morris & Heckscher LLP

(57) **ABSTRACT**

A building entrance protector assembly includes a building entrance protector housing having an opening. The housing includes a plurality of concentric cylindrical side walls around the opening. Each side wall at least partly overlies another one of the side walls. At least one annular surface is provided at an end of the side walls distal from the flange. The distance between the flange and each distal (annular or disk shaped) surface increases monotonically from an outermost annular surface to an innermost annular or circular surface. Each annular surface is located at a respectively different distance from the flange. Each side wall is connected to an adjacent side wall by one of the annular surfaces. One or more of the inner side walls may be cut away to accommodate a variety of cable sizes. A cable passes through an innermost one of the side walls. A heat shrink tubing secures the cable to the adapter. The heat shrink tubing is adhered to the cable and the outermost side wall. The innermost side wall has approximately the same diameter as the cable. Optionally, the housing has an adapter mounted on it. The adapter includes the side walls and the annular surface. The adapter includes a mounting flange for mounting the adapter to the housing. Alternatively, the side walls, annular surfaces and distal circular surface may be formed integrally as a part of the end cap of the housing.

6 Claims, 7 Drawing Sheets



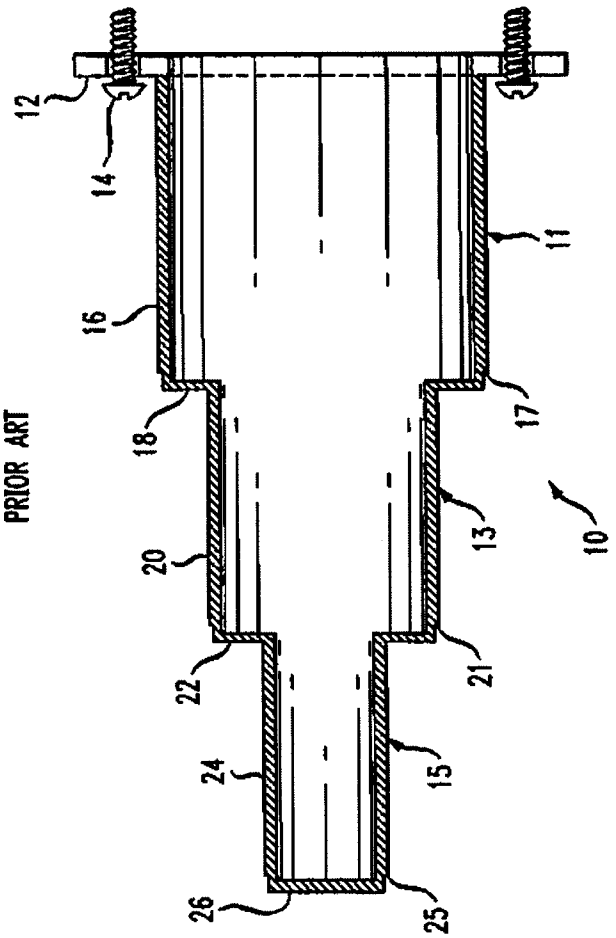


FIG. 2
PRIOR ART

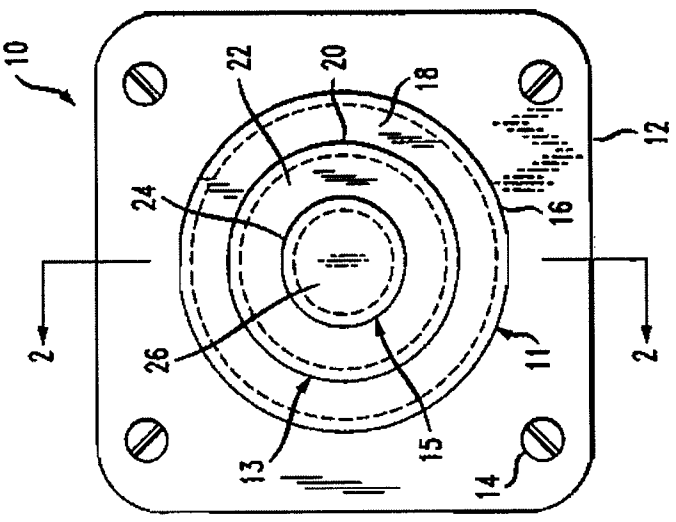


FIG. 1
PRIOR ART

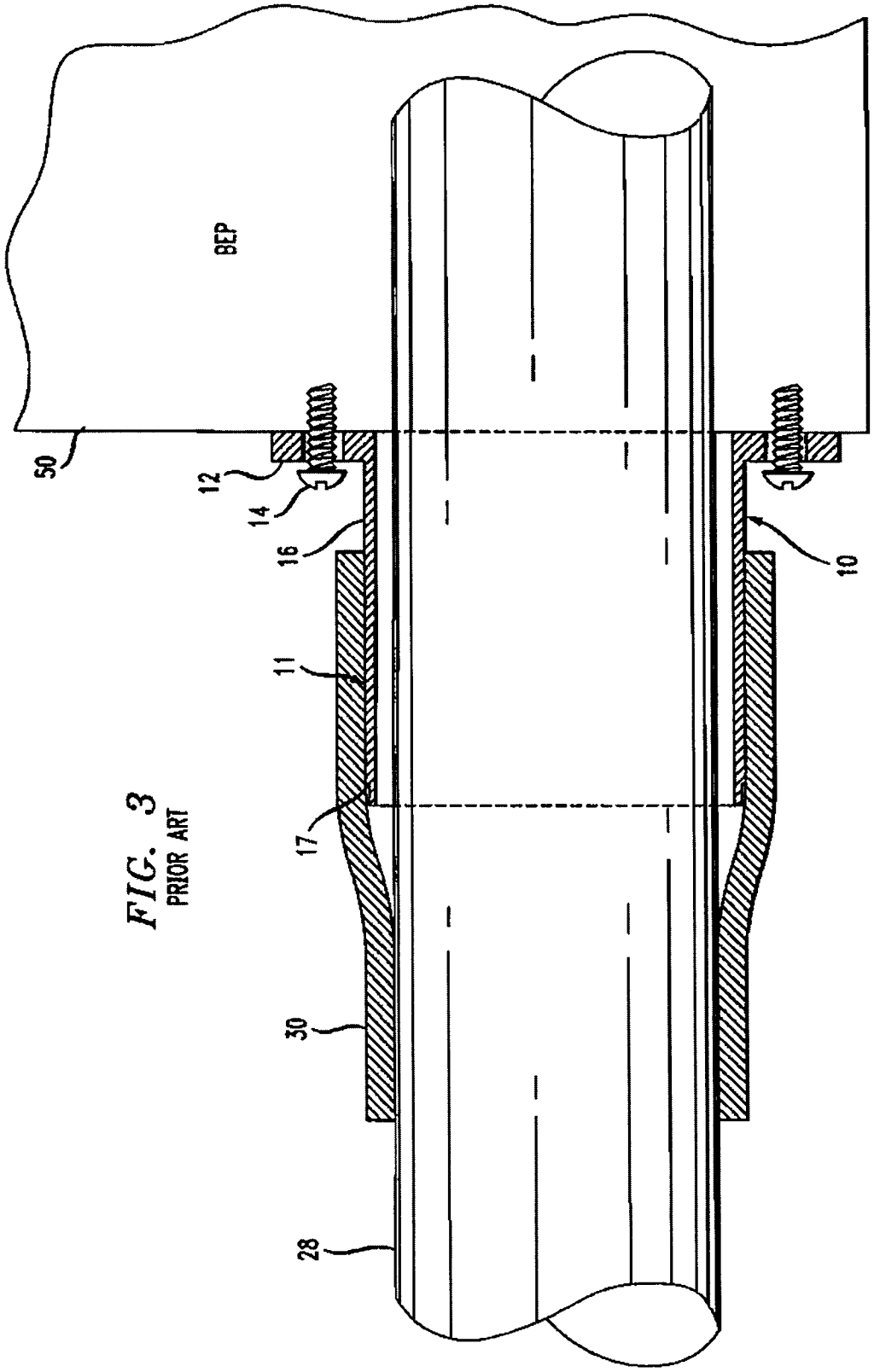


FIG. 3
PRIOR ART

FIG. 5

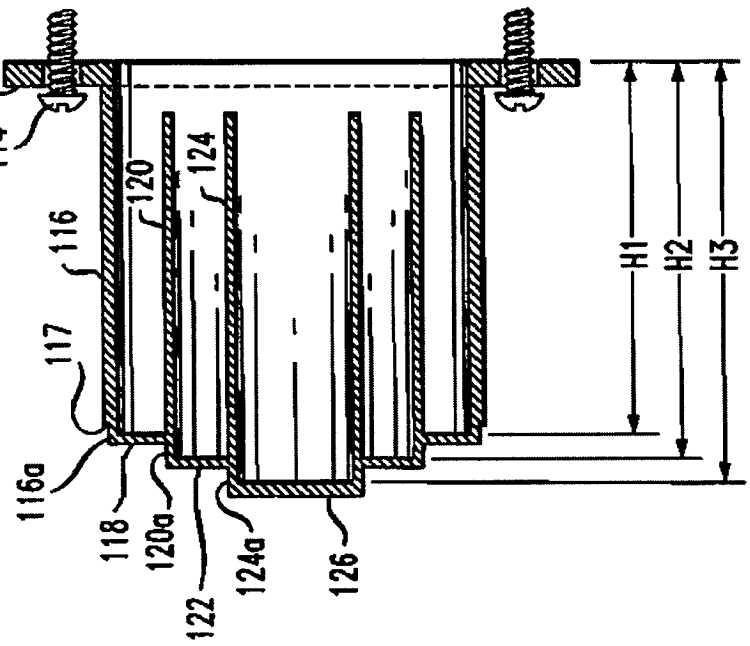
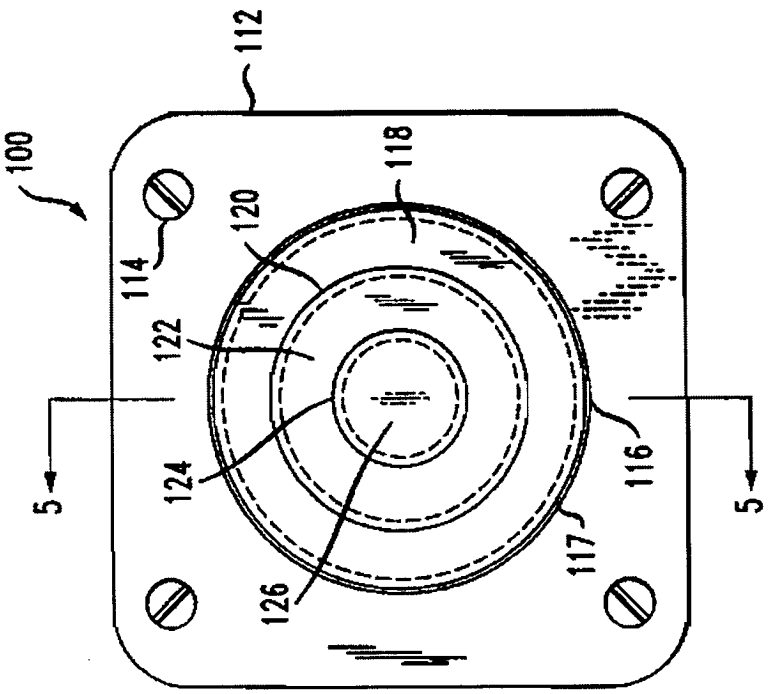

100
112
114
116
117
116a
118
120
120a
122
124
124a
126
H1
H2
H3

FIG. 4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112
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5
5

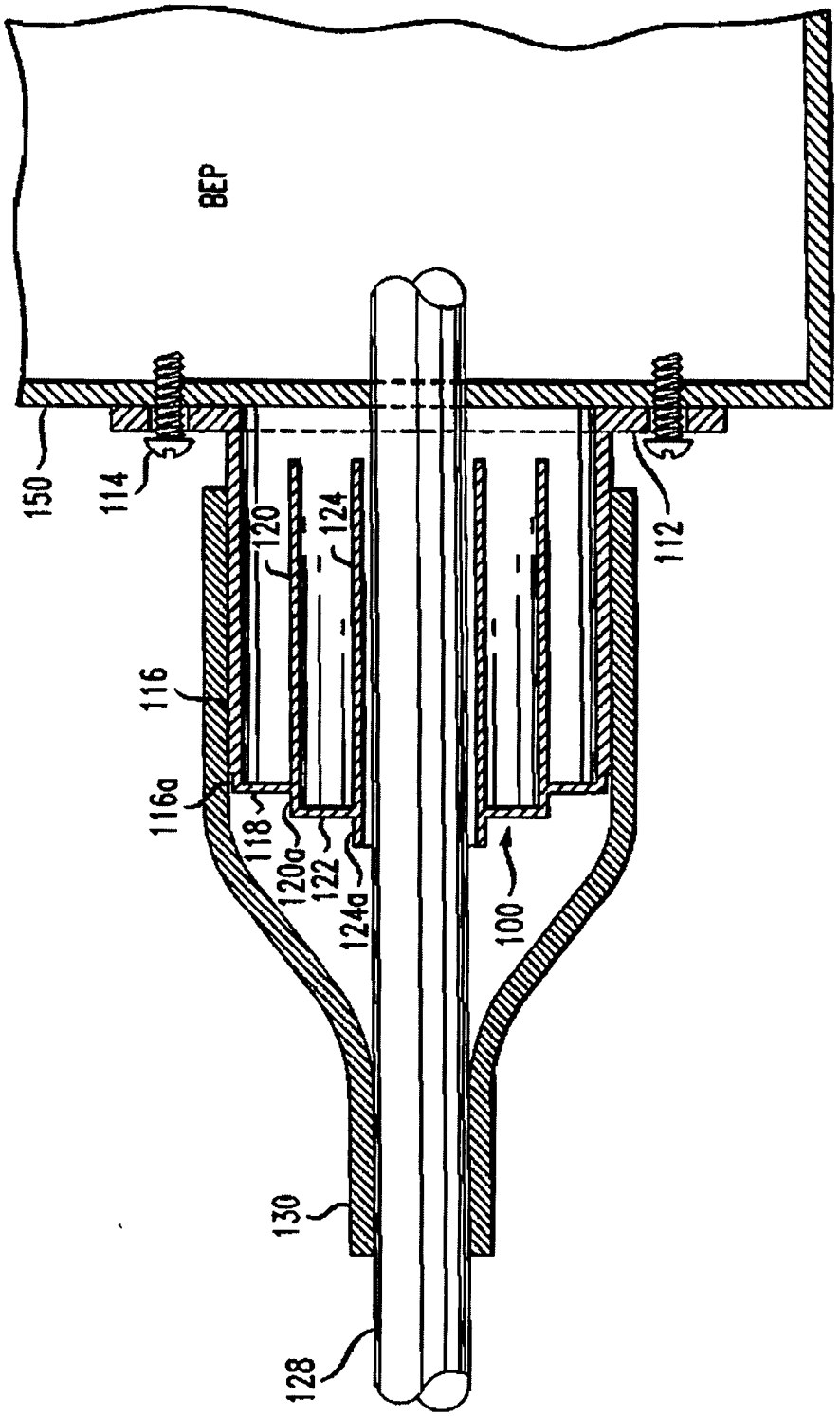


FIG. 6

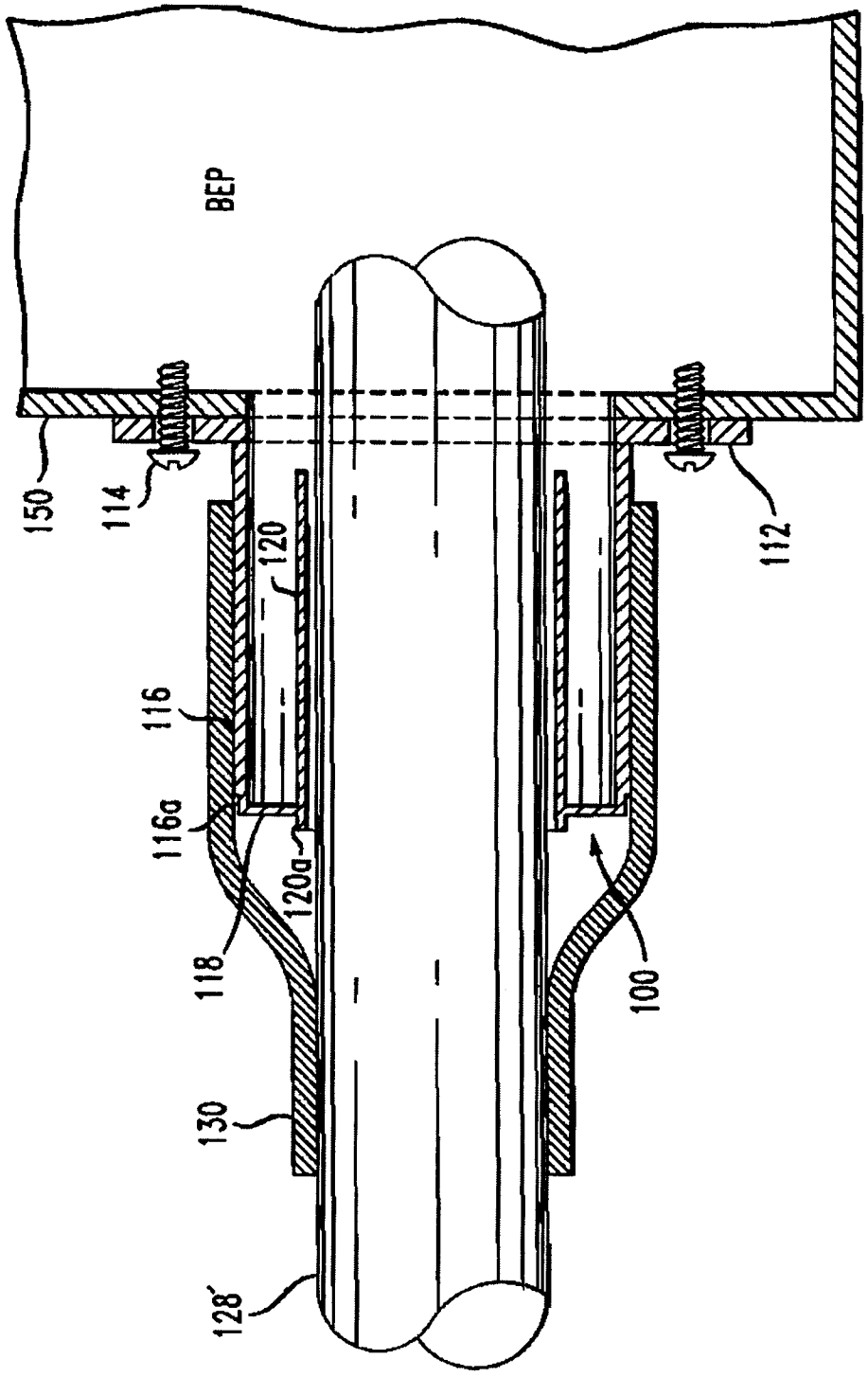


FIG. 7

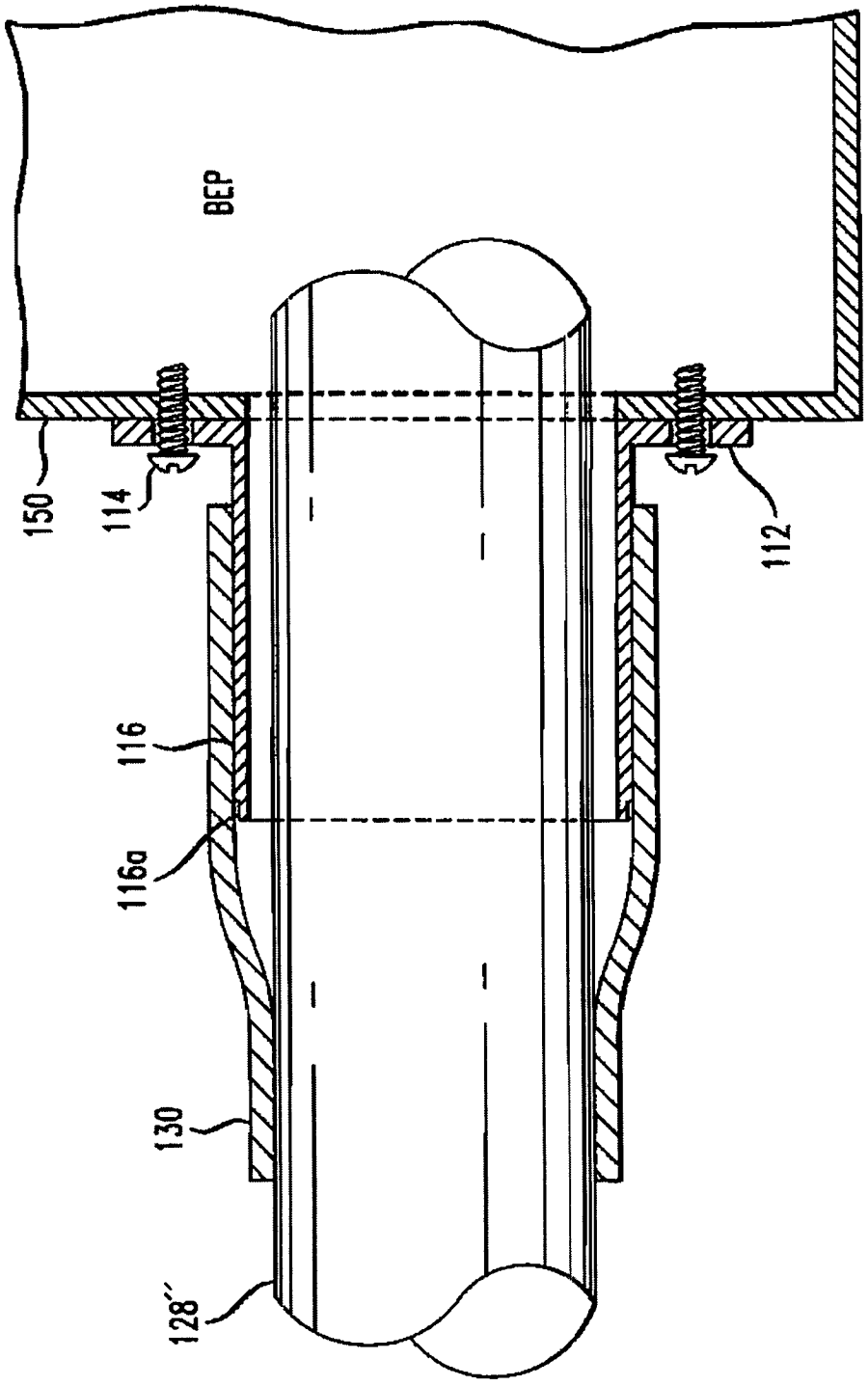
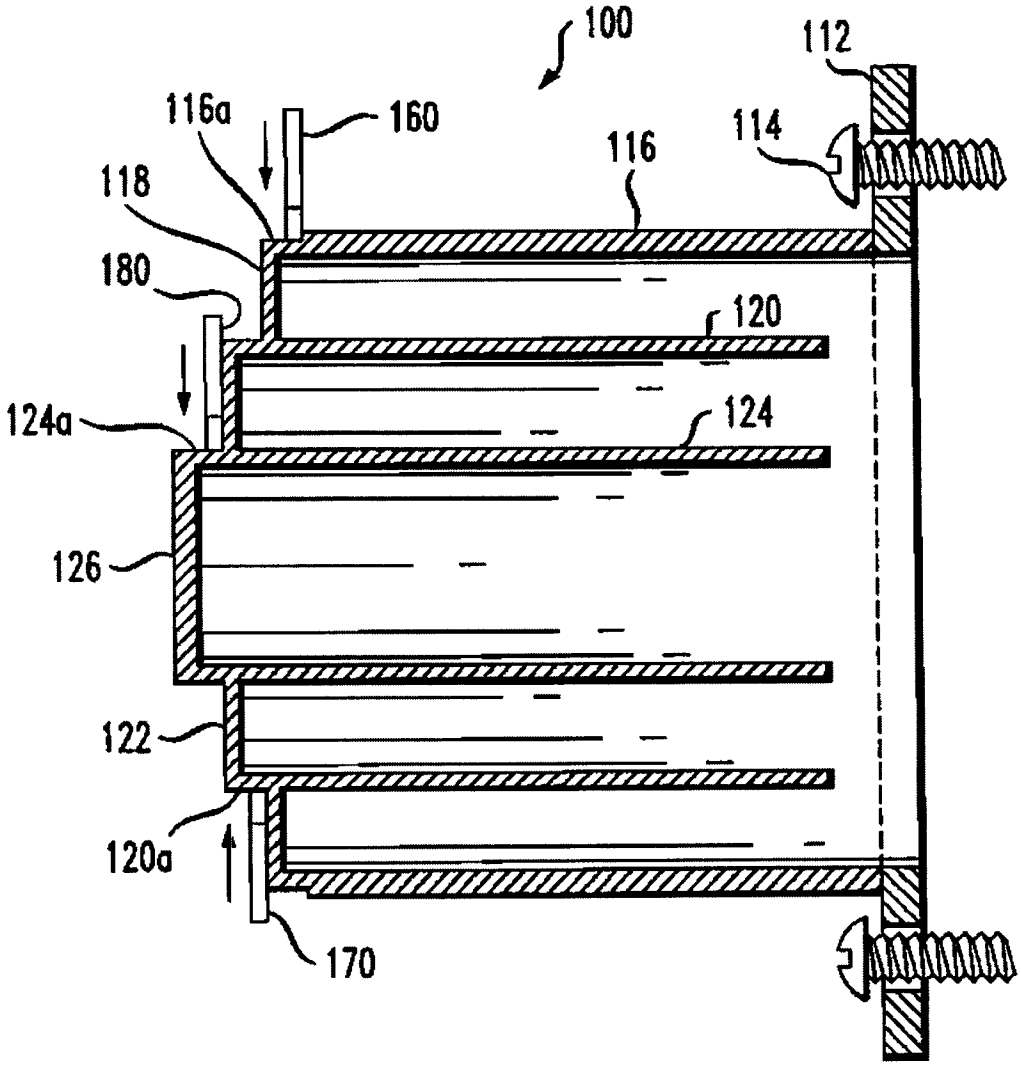


FIG. 8

FIG. 9



LOW PROFILE ADAPTER FOR VARIABLE SIZE HEAT SHRINK TUBING JOINT

FIELD OF THE INVENTION

The present invention relates to telecommunications equipment generally, and more specifically to adapters for connecting a cable to an enclosure, such as a building entrance protector.

DESCRIPTION OF THE RELATED ART

A building entrance protector (BEP) enclosure houses the physical interface between the nodes of a local telecommunications network and a telecommunications cable. For example, a BEP enclosure may house the interface hardware between the telephones of an office building and an exterior telephone cable having a number of twisted copper pairs that carry the voice signals for those telephones. A BEP enclosure is typically mounted in the basement or first floor of the office building. A BEP enclosure may also be used to house the interface hardware for systems based on fiber optical communications. Similarly, BEP enclosures may be used with telecommunications systems carrying signals other than just telephone voice signals.

A BEP enclosure provides two main functions: (1) it houses the hardware that provides connections between a cable and the individual nodes (e.g., telephones) of a local network; and (2) it houses the hardware that provides electrical isolation between the cable and the local network. Electrical isolation is intended to prevent any high voltages and/or high currents that may exist from time to time in the cable from reaching the local network. For example, a BEP enclosure will house isolation components designed to protect telephone users from lightning striking a telephone cable. Such electrical isolation is typically provided by 5-pin plug-in protectors that quickly connect signals to ground upon detection of sufficiently high voltages or currents. Building entrance protectors are described in U.S. Pat. Nos. 5,803,292 and 5,907,127, which are expressly incorporated by reference herein.

The end cap of a BEP may include one or more cable ports, which extend outwardly from the end cap. The cable port allows the cable to enter into the enclosure. If the housing is to be pressurized, then heat shrink tubing is commonly used. The heat shrink tubing secures the cable to the BEP housing, aligns the cable, and provides a seal to protect the fiber enclosure from the outdoor environments.

If the cable port size is too large relative to the cable size, the cable does not remain aligned straight within the port. A wobbly cable could result in damage to the exposed fibers within the enclosure. To alleviate this problem, different sized ports may be required to maintain a firm hold on the fiber cable, typically, small, medium and large. To fit an equal number of small, medium and large ports within the limited space of the enclosure end cap, the number of any port size would be reduced to one third of the total number of cable ports.

FIGS. 1 and 2 show a multi-size adapter **10** according to the prior art. Adapter **10** can accommodate a small, medium or large cable. Adapter **10** has three cable ports **11**, **13** and **15**, with respective cylindrical side walls, **16**, **20** and **24**. Cable ports **11**, **13** and **15** are sized to accommodate large, medium (not shown) and small (not shown) cables respectively. For each cable size, a different portion of adapter **10** is cut away to leave an appropriately sized cable port **11**, **13** or **15** for the cable being accommodated.

For example, FIG. 3 shows an adapter that has been cut between the ledge 17 and the flat surface 18 to accommodate

a large cable **28**. The portion of the adapter **10** to the left of ledge **17** in FIG. **2** (including side walls **20** and **24**, and flat surfaces **22** and **26**) is cut away and discarded. The remaining portion of adapter **10** includes a mounting flange **12** and a cable port **11** having side wall **16** with a size that is matched to the cable **28** and the heat shrink tubing **30**. The adapter **10** is mounted to the end cap of a BEP **50** using fasteners **14**. The heat shrink tubing **30** is placed over the cable port **11**. The cable **28** is fit through the heat shrink tubing **30** and the cable port **11** of adapter **10**. The tubing **30** is heated, typically using a heat gun, and the tubing shrinks to form a sealed joint around the cable port **11** and the cable **28**.

As best seen in FIG. **2**, the adapter **10** has a length that is three times the length of an adaptor (not shown) that is designed to accommodate only a single cable size. This may be a disadvantage if, for example, it is desired to install more than one BEP **50** in a small space, or if it is desired to install a BEP near the floor. In either case, the length of the adapter **10** may exceed the available space. A more compact adapter is desired.

SUMMARY OF THE INVENTION

The present invention is an adapter for securing a cable to a housing. The adapter has a flange that is attachable to the housing. The adapter has a plurality of concentric cylindrical side walls, at least one of which is connected to the flange. Each side wall at least partially overlies an adjacent one of the plurality of side walls. The adapter has a plurality of annular surfaces. Each side wall is connected to an adjacent side wall by one of the plurality of annular surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings of this application are not drawn to scale. In particular, several dimensions are exaggerated to improve the readability of the drawings.

FIG. **1** is a plan view of a conventional cable adapter capable of accommodating multiple cable sizes.

FIG. **2** is a cross sectional view of the conventional adapter of FIG. **1**, taken along section line **2**—**2** of FIG. **1**.

FIG. **3** is a cross sectional view of a conventional BEP assembly including the adapter of FIG. **2**, after removing the small and medium diameter cable ports and securing a cable to the adapter.

FIG. **4** is a plan view of an exemplary adapter according to the present invention.

FIG. **5** is a cross sectional view of the adapter of FIG. **4**, taken along section line **5**—**5** of FIG. **4**.

FIG. **6** is a cross sectional view of a BEP assembly including the adapter of FIG. **4**, after removing the small disk shaped surface from the distal end to accommodate a small cable.

FIG. **7** is a cross sectional view of a BEP assembly including the adapter of FIG. **4**, after removing the small and medium flat surfaces and small cylindrical side wall to accommodate a medium cable.

FIG. **8** is a cross sectional view of a BEP assembly including the adapter of FIG. **4**, after removing the small, medium and large flat surfaces and small and medium cylindrical side walls to accommodate a large cable.

FIG. **9** shows three blade positions that are used to cut the adapter to any of the configurations of FIGS. **6**–**8**.

DETAILED DESCRIPTION

FIGS. **4** and **5** show an exemplary adapter **100** according *to the invention. The adapter 100 is used to secure a cable*

128 to a housing 150. The adapter 100 is advantageous for securing any of a variety of cable sizes to the housing 150 with heat shrink tubing 130. Unlike the adapters of the prior art, adapter 100 has overlapping cylindrical side walls 116, 120 and 124, providing a lower profile. The lower profile allows the adapter to fit into smaller spaces without any loss of function. For the exemplary configuration shown in FIGS. 4 and 5, the height H3 of the adapter is approximately one third (⅓) of the height of the conventional adapter 10 shown in FIGS. 1 and 2. Nevertheless, adapter 100 provides a small gap size between the inside diameter of the adapter and a variety of differently sized cables, allowing formation of a heat shrink joint that can withstand over 50 ft.-lb. (67.8 m-N) of torque.

The adapter 100 has a flange 112 that is attachable to the housing 150. The adapter 100 has a plurality of concentric cylindrical side walls 116, 120, and 124, at least one of which is connected to the flange 112. Each side wall 116, 120, 124 at least partially overlies an adjacent one of the plurality of side walls. In the exemplary embodiment, side wall 120 overlaps (overlies and extends beyond) side wall 116, and side wall 124 overlaps side wall 120.

The adapter has a plurality of annular surfaces 118 and 122. Each annular surface 118 and 122 is positioned at an end of a respective side wall 116 and 120 that is distal from the flange 112. Each side wall 116, 120 and 124 is connected to an adjacent side wall by one of the plurality of annular surfaces 118 and 122. For example, side wall 116 is connected to side wall 120 by annular surface 118. Side wall 120 is connected to side wall 124 by annular surface 122.

Advantageously, each of the inner cylindrical side wall 120, 124 is only attached at its distal end, so that the adapter 100 can be cut to accommodate the appropriate cable size after the adapter is installed on the housing 150.

In addition to the annular surfaces 118 and 122, the innermost cylinder 124 has a flat circular surface 126 at the distal end of the side wall. Surface 126 is located further from the flange 112 than the annular surfaces 118 and 122. If the adapter 100 is installed on the BEP housing 150 before a cable is installed in the adapter, the combination of the cylindrical side walls 116, 120, 124, the annular surfaces 118, 122 and the circular surface 126 form a sealed adapter, so that the BEP 150 can be pressurized. If the adapter is only to be mounted to the housing when a cable is to be sealed to the adapter, then the adapter need not have the surface 126, and an adapter formed without surface 126 would perform the same function.

Each annular surface 118, 122 and disk 126 is located at a respectively different distance H1, H2, H3 from the flange 112. In the exemplary embodiment, the distance from the flange 112 increases monotonically from an outermost annular surface 118 (distance=H1) to an innermost annular surface 122 (distance=H2) and to the inner disk 126 (distance=H3).

Preferably, the side walls 116, 120 and 124 in each pair of successive side walls differ from each other in height by at least a thickness of a blade 160, 170, 180 (FIG. 9) used to cut unused ones of the plurality of side walls from the adapter 100. That is, the differences (H3-H2) and (H2-H1) are each sufficient so that one or more of the cylinders can be severed by cutting a portion of the distal end of adapter 100. Preferably, the distance in height is small relative to the height of the cylindrical walls, so that the overall height H3 of the adapter 100 is small.

In the exemplary embodiment, at least one side wall 116 has a ledge 117 thereon, proximate to the end of the side wall 116 distal from the flange 112. The annular surfaces 118, 122 and ledge 117 are discussed below with reference to the method for using the adapter 100 to secure a cable 128.

The adapter 100 may be made of any rigid material that is easy to cut. Exemplary materials include polymers, such as polycarbonate and polyvinyl chloride. These materials are easily cut in the field with a saw 160, 170 or 180 (FIG. 9). Although metal may also be used, metal is more difficult to cut with manual tools.

FIGS. 6, 7 and 8 show three different configurations into which adapter 100 may be cut to accommodate three respective cable sizes. In each case, a portion of a selected one of the side walls 116, 120 or 124 is cut, so as to remove any side wall that is smaller in diameter than the selected side wall. Then, the cable is secured to the side wall 116 having the largest diameter. Once the adapter 100 is properly cut, the innermost remaining side wall has approximately the same diameter as the cable. A small clearance is allowed between the inner diameter of the adapter and the sheathing of the cable, so that the inner wall of the adapter guides the cable without forming an interference fit.

FIG. 6 shows the configuration of the adapter 100 for securing a small cable 128 to the BEP housing 150. The distal end 124a of innermost cylindrical side wall 124 is cut (using a knife or saw), severing the circular flat surface 126. In this configuration, the adapter 100 now has an inner diameter sized to accommodate the small sized cable 128. Because the adapter wall 124 has a minimal clearance around the cable 128, the cable alignment is maintained, and the cable cannot wobble or work itself loose. The heat shrink tubing 130 has a wide range of shrinkage capability, and can shrink at one end to grip a small diameter cable 128 at the same time that the other end of the tubing 130 grips a relatively large adapter surface 116.

As noted above, the drawings are not to scale. In particular, the configuration of FIG. 6, has the greatest difference between the outer diameter of side wall 116 and the diameter of the cable 128. This gap about 0.1 inch (2.5 mm)

FIG. 7 shows the configuration of the adapter 100 for securing a medium cable 128' to the BEP housing 150. The distal end 120a of the middle cylindrical side wall 120 is cut (using a knife or saw), severing the wall 120. In this configuration, the adapter 100 now has an inner diameter sized to accommodate the medium sized cable 128'. Again, the adapter wall 120 has a minimal clearance around the cable 128', so the cable alignment is maintained, and the cable cannot wobble or work itself loose.

FIG. 8 shows the configuration of the adapter 100 for securing a large cable 128" to the BEP housing 150. The distal end 116a of the outermost cylindrical side wall 116 is cut (using a knife or saw), severing the wall 116. In this configuration, the adapter 100 now has an inner diameter sized to accommodate the large sized cable 128". As in the case of the small and medium cables 128 and 128', the adapter wall 116 has a minimal clearance around the cable 128", so the cable alignment is maintained, and the cable cannot wobble or work itself loose.

FIG. 9 shows three different blade positions, indicated by blades 160, 170 and 180. The adapter 100 can be cut to accommodate a cable by aligning a blade on one of the annular surfaces that is adjacent to the selected side wall and is connected to the selected side wall at an inner circumference of that annular surface, and cutting the selected side wall with the aligned blade. For example, to accommodate a small cable, the blade 180 is aligned on annular surface

122 (which is adjacent to the side wall 124 to be cut), and the end 124a of side wall 124 is cut. Similarly, to accommodate a medium cable, the blade 170 is aligned on annular surface 118, and the end 120a of side wall 120 is cut.

In the case of a large diameter cable, the adapter 100 is prepared by aligning the blade 160 on a ledge 117 of the selected side wall 116, and cutting the selected side wall with the aligned blade.

Either before or after the adapter 100 is cut to accommodate the selected cable size, the adapter is fastened to the housing 150 by driving fasteners 114 through the flange 112 connected to the outermost cylindrical wall side 116. After the adapter is cut and the adapter is fastened to the housing 150, the cable 128, 128' or 128" is inserted through the selected cylindrical wall 124, 120 or 116, respectively. A heat-shrink tubing 130 is fit over the outermost cylindrical wall 116 and over a portion of the cable 128, 128' or 128" protruding through the selected cylindrical wall. The heat-shrink tubing 130 is then heated to form a seal over the outermost cylindrical wall 116 and the portion of the cable 128, 128' or 128". The heat shrink tubing 130 is adhered to the cable 128, 128' or 128" and the outermost side wall 116.

Although the exemplary adapter includes three cable ports, it is contemplated that adapters according to the present invention may be formed to accommodate any number of cable sizes, by adding additional cylindrical side walls, and connecting distal annular flat surfaces.

Although the exemplary housing 150 is a building entrance protector housing, the invention may be practiced to secure a cable to other types of housings, to form a high pressure seal. Although the exemplary cables 128, 128' and 128" have optical fibers therein, the invention may be used to secure other types of cables to a housing. Although the invention is advantageous for housings subjected to high pressure, it may also be used for securing a cable to a housing that is not pressurized.

Although the exemplary embodiment includes an adapter that is separate and distinct from the BEP housing 150, the adapter may be formed integrally as a portion of the end cap of the BEP housing, in which case the end cap and adapter form a single component.

Although the invention has been described in terms of exemplary embodiments, it is not limited thereto. Rather, the appended claim should be construed broadly, to include other variants and embodiments of the invention which may be made by those skilled in the art without departing from the scope and range of equivalents of the invention.

What is claimed is:

1. A method for securing a cable to a housing, comprising the steps of:

(a) providing a housing having an opening with a plurality of concentric cylindrical side walls adjacent the opening, each side wall at least partially overlying an adjacent one of the plurality of side walls, the housing having at least one annular surface, each side wall connected to an adjacent side wall by a respective annular surface, at least one of said side walls having a ledge thereon;

(b) aligning a blade on a ledge of a selected side wall;

(c) cutting a portion of the selected side wall with the aligned blade, so as to remove any side wall that is smaller in diameter than the selected side wall; and

(d) securing the cable to the side wall having the largest diameter.

2. The method of claim 1, wherein step (d) includes:

inserting the cable through the selected cylindrical wall;

fitting a heat-shrink tubing over the outermost one of the cylindrical walls and over a portion of the cable protruding through the selected cylindrical wall; and

heating the heat-shrink tubing to form a seal over the outermost cylindrical wall and the portion of the cable.

3. The method of claim 1, wherein step (a) includes fastening an adapter to the housing, the adapter including the plurality of side walls and a mounting flange connected to an outermost one of the side walls.

4. The method of claim 3, wherein said ledge is at an end of said at least one side wall distal from said flange.

5. The method of claim 1, wherein said concentric cylindrical side walls are rigid.

6. The method of claim 1, wherein said concentric cylindrical side walls are fixed.

* * * * *

US006362427B1

(12) **United States Patent**
Daoud

(10) **Patent No.: US 6,362,427 B1**
(45) **Date of Patent: Mar. 26, 2002**

(54) **LOW PROFILE ADAPTER FOR VARIABLE SIZE TUBING**

(75) Inventor: **Bassel Hage Daoud**, Parsippany, NJ (US)

(73) Assignee: **Avaya Technology Corp.**, Basking Ridge, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/372,337**

(22) Filed: **Aug. 11, 1999**

(51) **Int. Cl.**[7] **H02G 3/18**
(52) **U.S. Cl.** ..... **174/65 R**; 174/65 G; 174/152 G
(58) **Field of Search** ..... 174/56, 57, 50, 174/65 G, 65 R, 135, 151, 152 G, 153 G; 220/402, 3.8, 3.92, 3.94; 285/4, 423, 424

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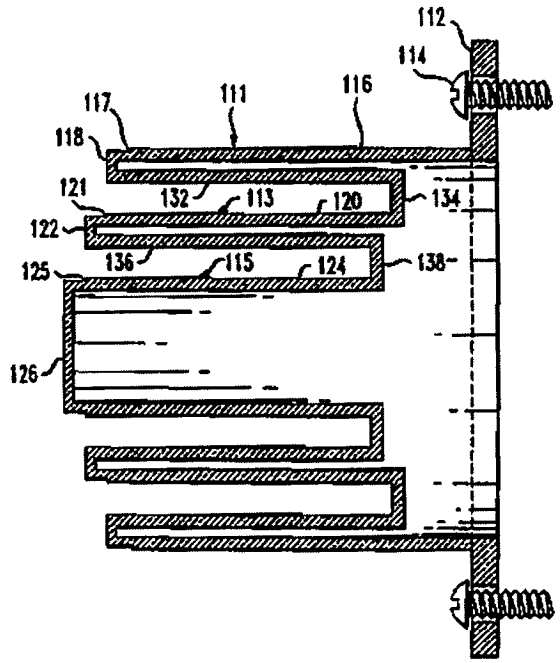
Primary Examiner—Dean A. Reichard
Assistant Examiner—Angel R. Estrada
(74) *Attorney, Agent, or Firm*—Duane, Morris & Heckscher LLP

(57) **ABSTRACT**

An adapter for securing a cable to a housing has a flange that is attachable to the housing and a plurality of concentric cable ports connected to the flange. Each cable port has a side wall. The side wall of each cable port overlaps a side wall of an adjacent one of the plurality of cable ports. Each cable port has a respective diameter and a respective height with respect to the flange, and the heights of the cable ports increase monotonically from the cable port having the largest diameter to the cable port having the smallest diameter. Each cable port other than the cable port having the smallest diameter has a flat surface at a distal end opposite the flange. Each pair of successive cable ports differ from each other in height by a constant amount that is at least a thickness of a blade used to cut unused ones of the plurality of cable ports from the adapter. Each cable port may have a ledge proximate to the distal end. The ledge of an inner one of an adjacent pair of cable ports within the plurality of cable ports is located at the same height as the flat surface at the distal end of the outer one of the pair of cable ports. The adapter may be formed from a single piece of material, adjacent cable ports connected to each other.

26 Claims, 7 Drawing Sheets



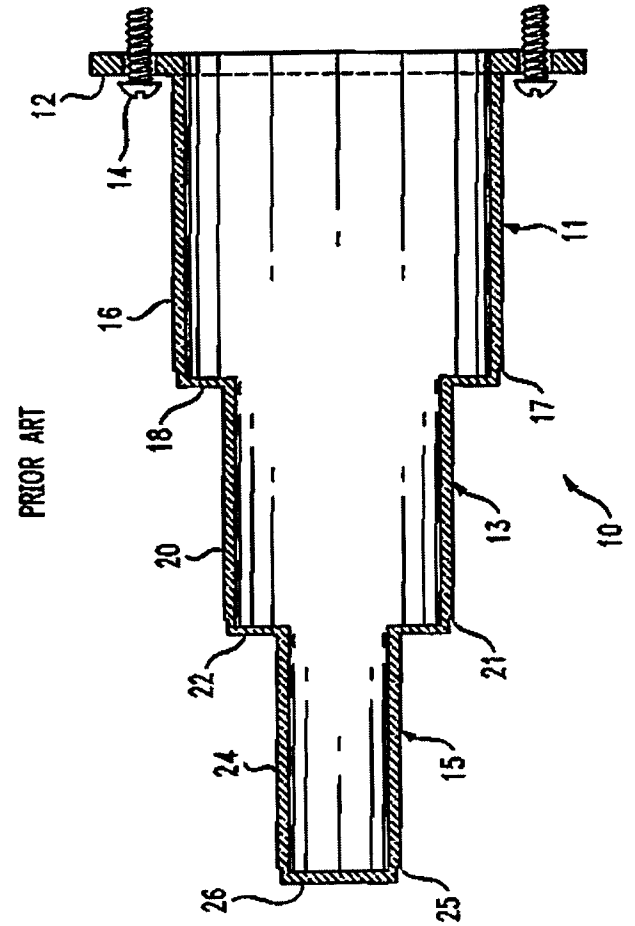


FIG. 2
PRIOR ART

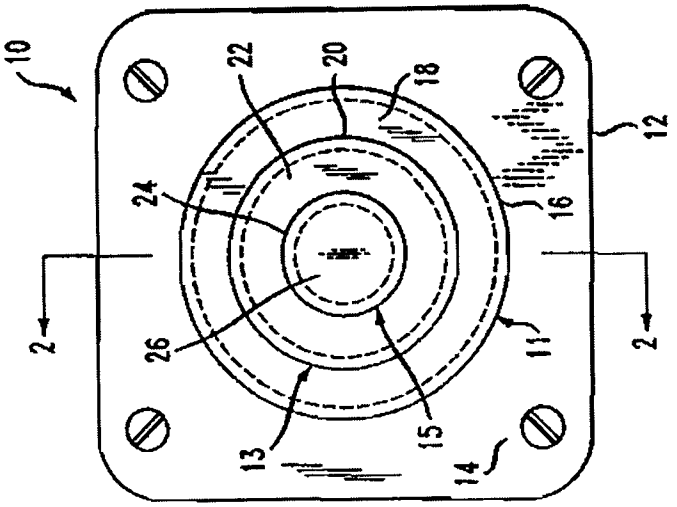


FIG. 1
PRIOR ART

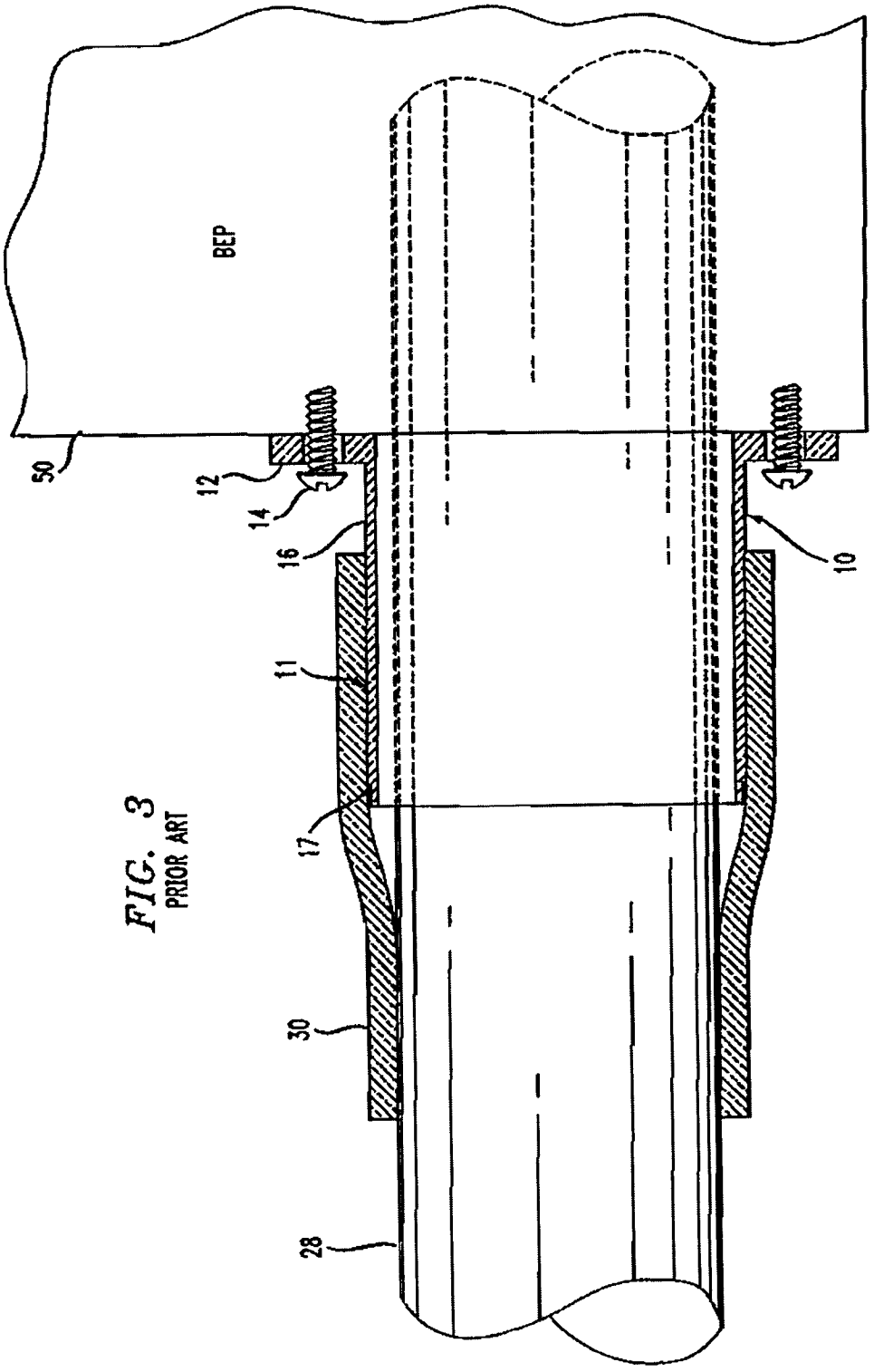


FIG. 3
PRIOR ART

FIG. 5

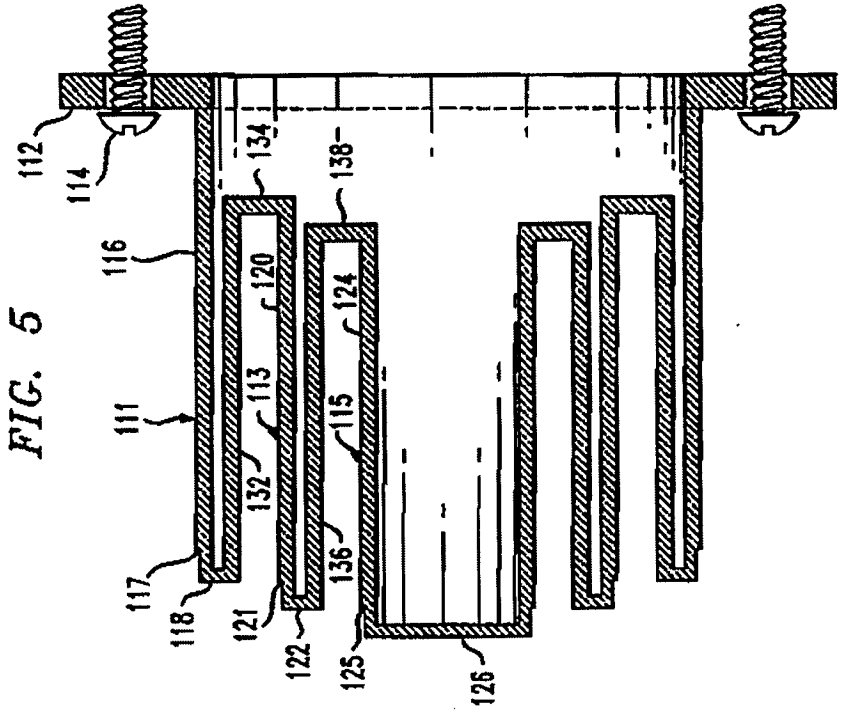

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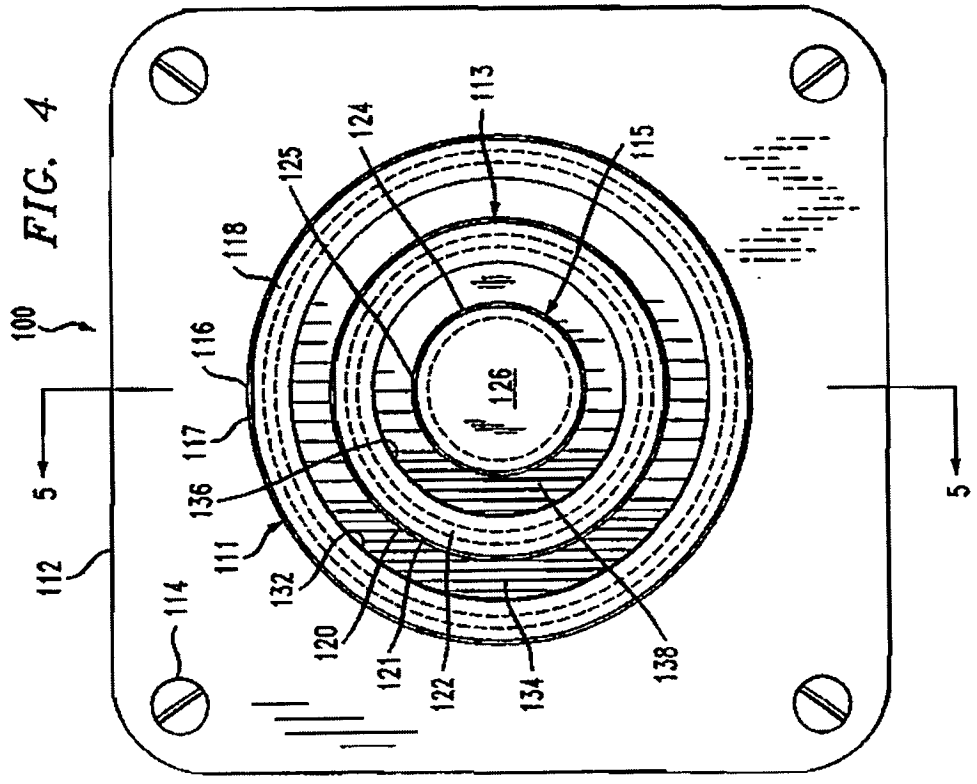
FIG. 4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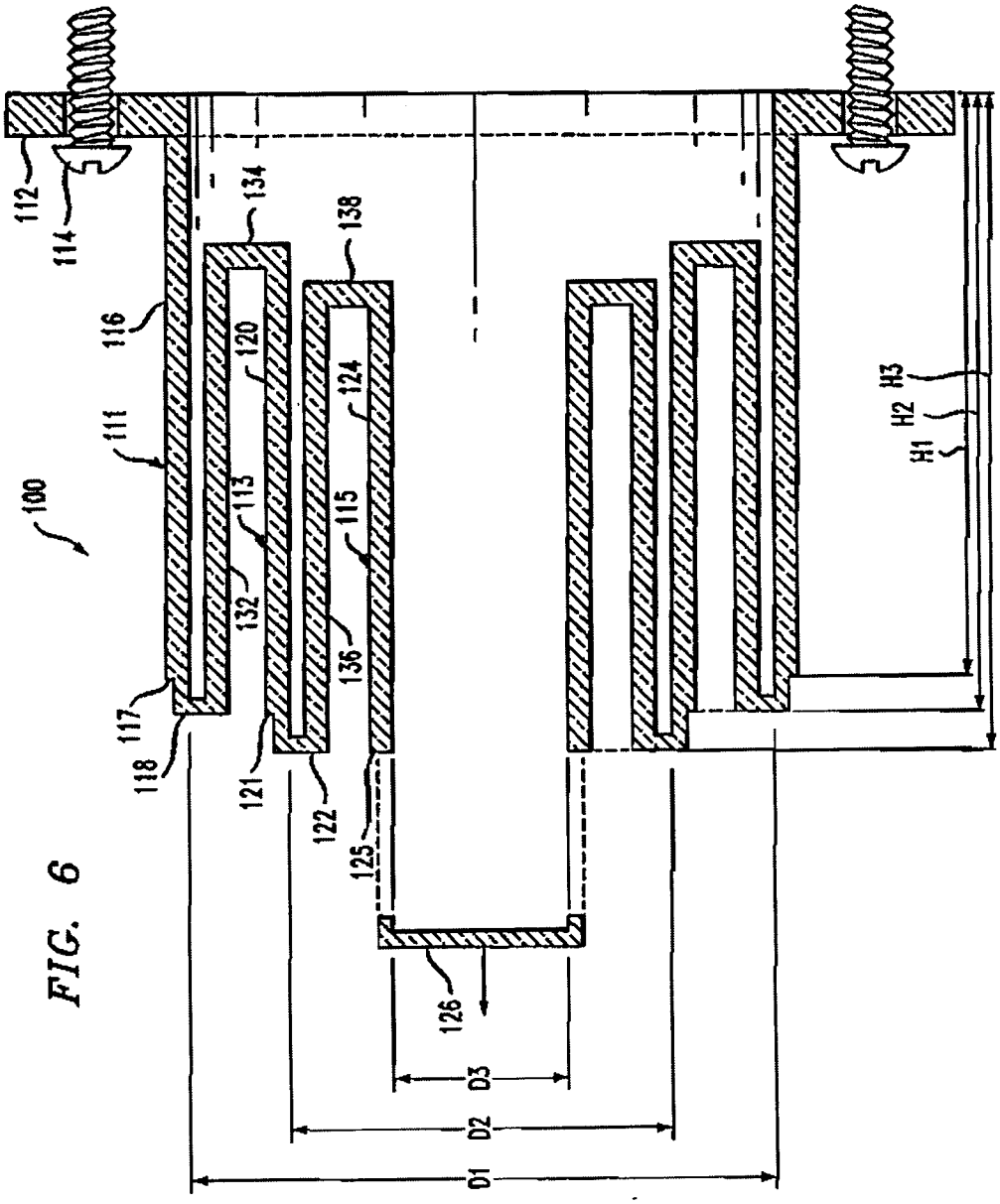
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H3
D1
D2
D3

FIG. 6

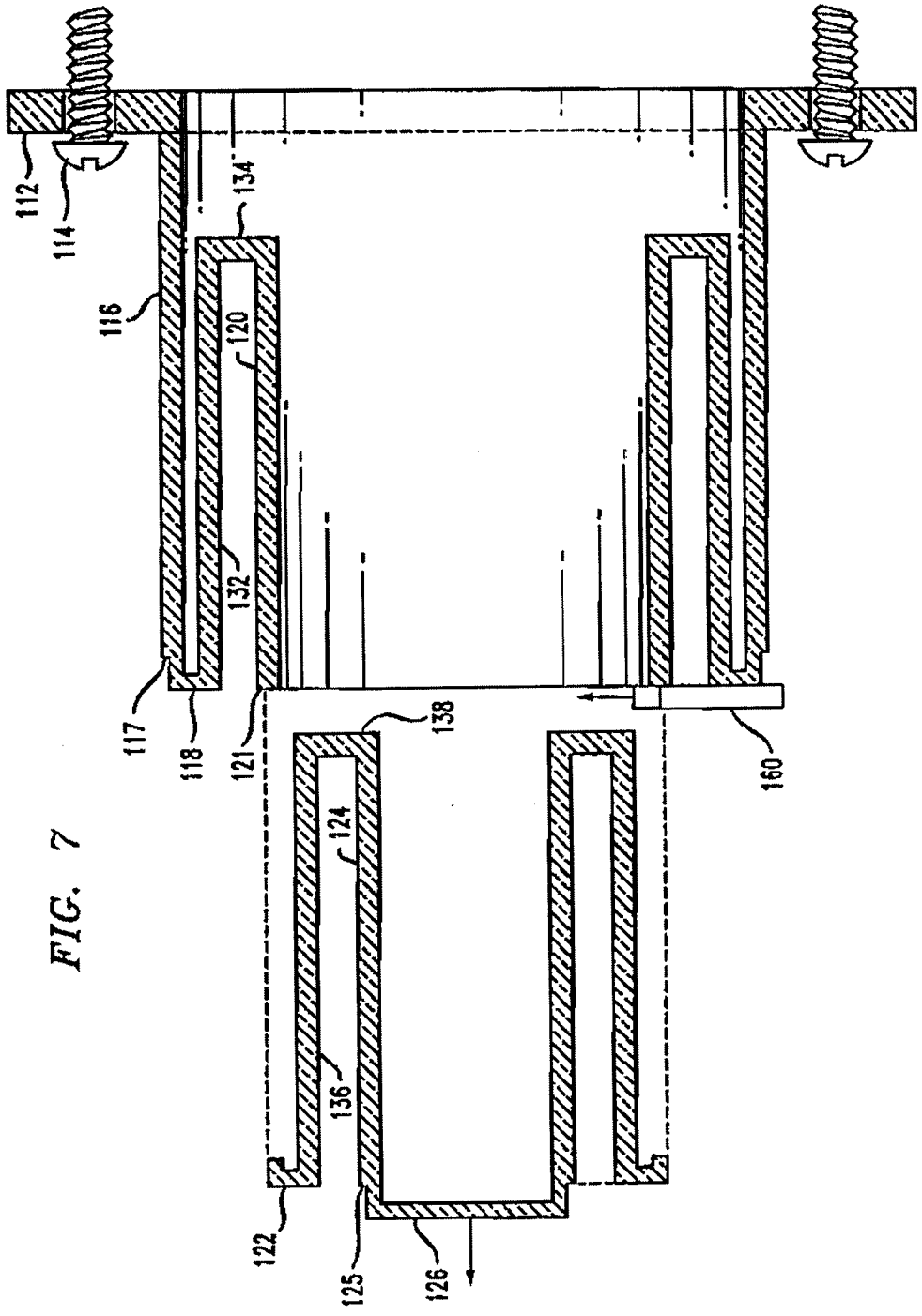

FIG. 7

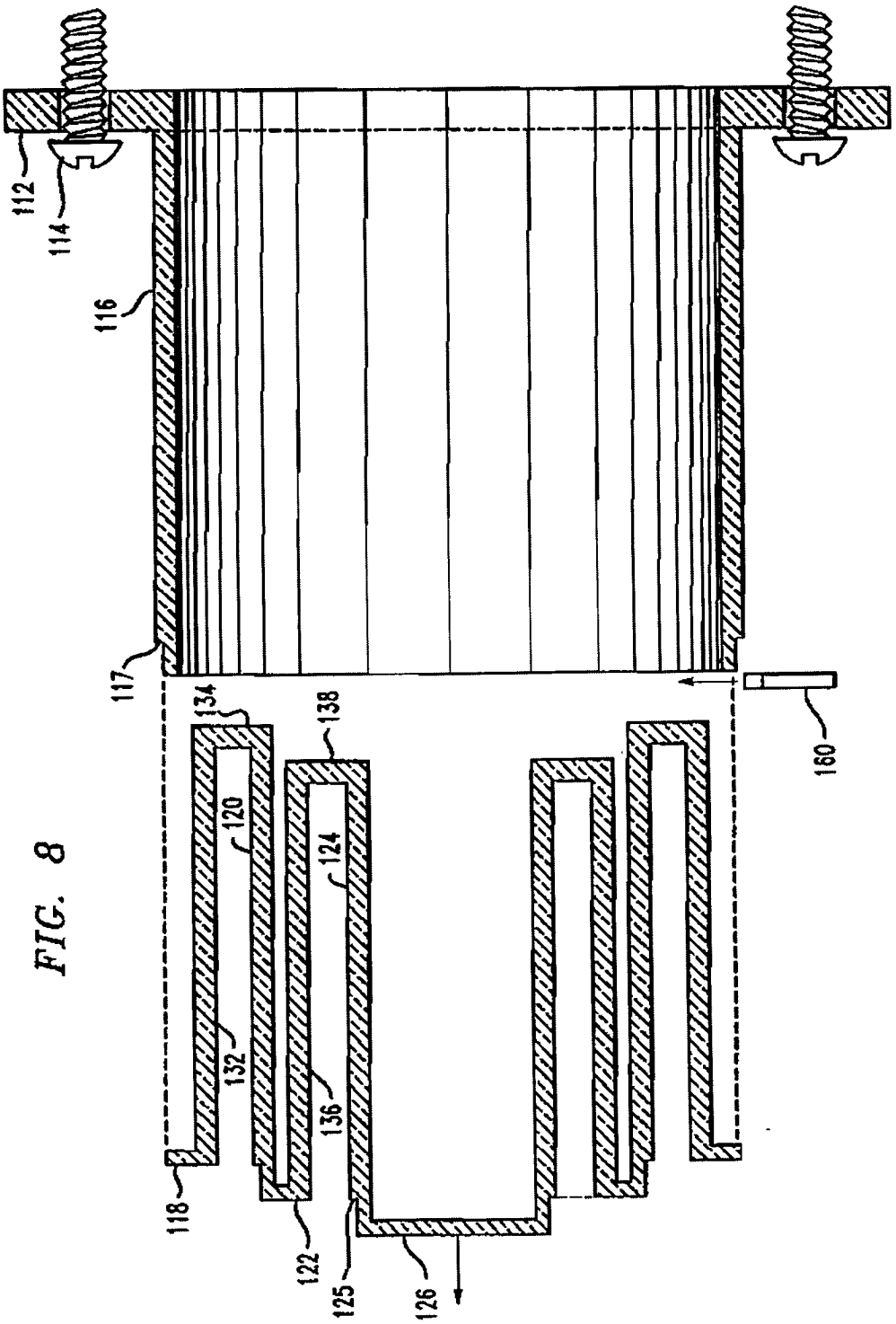

FIG. 8

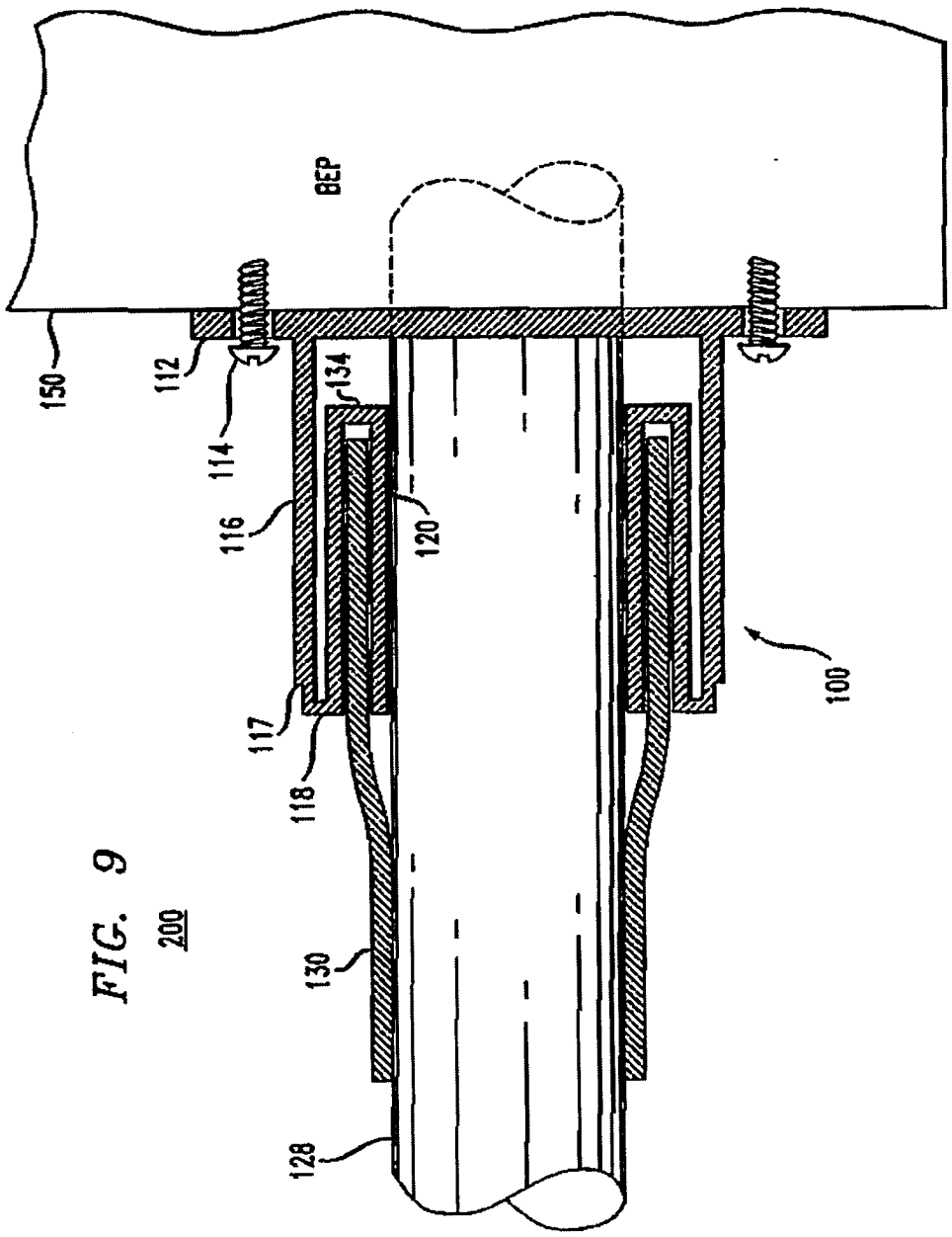

FIG. 9

200

LOW PROFILE ADAPTER FOR VARIABLE SIZE TUBING

FIELD OF THE INVENTION

The present invention relates to telecommunications equipment generally, and more specifically to adapters for connecting a cable to an enclosure, such as a building entrance protector.

DESCRIPTION OF THE RELATED ART

A building entrance protector (BEP) enclosure houses the physical interface between the nodes of a local telecommunications network and a telecommunications cable. For example, a BEP enclosure may house the interface hardware between the telephones of an office building and an exterior telephone cable having a number of twisted copper pairs that carry the voice signals for those telephones. A BEP enclosure is typically mounted in the basement or first floor of the office building. A BEP enclosure may also be used to house the interface hardware for systems based on fiber optical communications. Similarly, BEP enclosures may be used with telecommunications systems carrying signals other than just telephone voice signals.

A BEP enclosure provides two main functions: (1) it houses the hardware that provides connections between a cable and the individual nodes (e.g., telephones) of a local network; and (2) it houses the hardware that provides electrical isolation between the cable and the local network. Electrical isolation is intended to prevent any high voltages and/or high currents that may exist from time to time in the cable from reaching the local network. For example, a BEP enclosure will house isolation components designed to protect telephone users from lightning striking a telephone cable. Such electrical isolation is typically provided by 5-pin plug-in protectors that quickly connect signals to ground upon detection of sufficiently high voltages or currents. Building entrance protectors are described in U.S. Pat. Nos. 5,803,292 and 5,907,127, which are expressly incorporated by reference herein.

The end cap of a BEP may include one or more cable ports, which extend outwardly from the end cap. The cable port allows the cable to enter into the enclosure. A cold shrink tubing is normally used to seal around both the cable and the cable port. Cold shrink tubing is described in U.S. Pat No. 3,515,798, U.S. Pat. No. 4,871,599, and U.S. Pat. No. 5,670,223, all of which are expressly incorporated herein by reference. The cold shrink tubing secures the cable to the BEP housing, aligns the cable, and provides a seal to protect the fiber enclosure from the outdoor environments.

Different size cables require different size ports. To perform its functions properly, a piece of cold shrink tubing must have a diameter that is suitable for the cable. A given size of cold shrink tubing does not have the range of shrinkage ability that is provided by heat shrink tubing. Thus, a given piece of cold shrink tubing cannot handle all cable sizes. A series of cold shrink tubing sizes are needed to seal around a wide range of cable sizes. For example, the Minnesota Mining and Manufacturing Co. of St. Paul, Minn. sells a series of products, numbers 4626L (or S) through 4631L (or S).

If the cable port size is too large relative to the cable size, the cable does not remain aligned straight within the port. A wobbly cable could result in damage to the exposed fibers within the enclosure. To alleviate this problem, different sized ports may also be required to maintain a firm hold on the fiber cable, typically, small, medium and large. To fit an equal number of small, medium and large ports within the limited space of the enclosure end cap, the number of any port size would be reduced to one third of the total number of cable ports.

FIGS. 1 and 2 show a multi-size adapter 10 according to the prior art. Adapter 10 can accommodate a small, medium or large cable. Adapter 10 has three cable ports 11, 13 and 15, with respective cylindrical side walls, 16, 20 and 24. Cable ports 11, 13 and 15 are sized to accommodate large, medium (not shown) and small (not shown) cables respectively. For each cable size, a different portion of adapter 10 is cut away to leave an appropriately sized cable port 11, 13 or 15 for the cable being accommodated.

For example, FIG. 3 shows an adapter that has been cut between the ledge 17 and the flat surface 18 of FIG. 2 to accommodate a large cable 28. The portion of the adapter 10 to the left of ledge 17 in FIG. 2 (including side walls 20 and 24, and flat surfaces 22 and 26) is cut away and discarded. The remaining portion of adapter 10 includes a mounting flange 12 and a cable port 11 having side wall 16 with a size that is matched to the cable 28 and the cold shrink tubing 30. The adapter 10 is mounted to the end cap of a BEP 50 using fasteners 14. The cold shrink tubing 30 with its core (not shown) still intact is placed over the cable port 11. The cable 28 is fit through the cold shrink tubing 30 and the cable port 11 of adapter 10. The core of the cold shrink tubing 30 is removed, and the tubing collapses to form a sealed joint around the cable port 11 and the cable 28.

As best seen in FIG. 2, the adapter 10 has a length that is three times the length of an adaptor (not shown) that is designed to accommodate only a single cable size. This may be a disadvantage if, for example, it is desired to install more than one BEP 50 in a small space, or if it is desired to install a BEP near the floor. In either case, the length of the adapter 10 may exceed the available space. A more compact adapter is desired.

SUMMARY OF THE INVENTION

The present invention is an adapter for securing a cable to a housing. The adapter has a flange that is attachable to the housing. A plurality of concentric cable ports are connected to the flange. Each cable port has a side wall. The side wall of each cable port overlaps a side wall of an adjacent one of the plurality of cable ports.

Another aspect of the invention is a method for securing a cable to a housing. An adapter is attached to the housing, the adapter having a plurality of concentric cable ports, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports. A portion of a selected one of the cable ports is cut, so as to remove any cable port that is smaller in diameter than the selected cable port. The cable is secured to the selected cable port.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a conventional cable adapter capable of accommodating multiple cable sizes.

FIG. 2 is a cross sectional view of the conventional adapter of FIG. 1, taken along section line 2—2 of FIG. 1.

FIG. 3 is a cross sectional view of a conventional BEP assembly including the adapter of FIG. 2, after removing the small and medium diameter cable ports and securing a cable to the adapter.

FIG. 4 is a of an exemplary adapter according to the present invention.

FIG. 5 is a cross sectional view of the adapter of FIG. 4, taken along section line 5—5 of FIG. 4.

FIG. 6 shows the adapter of FIG. 5, with the smallest diameter flat center portion removed to accommodate a small diameter cable.

FIG. 7 shows the adapter of FIG. 5, with small diameter cable port removed to accommodate a medium sized cable.

FIG. 8 shows the adapter of FIG. 5, with the small and medium diameter cable ports removed to accommodate a large sized cable.

FIG. 9 shows a BEP assembly including the adapter cut as shown in FIG .7, after securing a medium sized cable to the medium size cable port.

DETAILED DESCRIPTION

FIGS. 4 and 5 show an exemplary adapter **100** according to the present invention. Adapter **100** may be used for securing a cable **128** to a housing **150** (FIG. 9), which may be a BEP cabinet.

Adapter **100** has a mounting flange **112** that is attachable to the housing **150**. The flange may be of a conventional design, including mounting holes to accommodate fasteners **114**. The fasteners may be of any conventional type, but screws are preferred, because of their pull-out strength, and ease of installation.

A plurality of concentric cable ports **111**, **113** and **115** are (directly or indirectly) connected to the flange **112**. Cable ports **111**, **113** and **115** have respective side walls **116**, **120** and **124**. The side wall **116**, **120** or **124** of each cable port **111**, **113** and **115** overlaps the side wall of an adjacent one of the plurality of cable ports. For example, side wall **120** overlaps both side walls **116** and **124**, and side wall **124** overlaps both side walls **116** and **120**. As used herein, the term "overlap" means that one of the side walls **116**, **120** or **124** coincides (at least in part) with another one of the side walls, and may optionally extend beyond that other one of the side walls.

As best seen in FIG. 6, each cable port **111**, **113**, **115** has a respective diameter and a respective height with respect to the flange. Port **111** has a diameter D1 and a height H1. Port **113** has a diameter D2 and a height H2. Port **115** has a diameter D3 and height H3. The heights H1, H2 and H3 of the cable ports **111**, **113** and **115** increase monotonically from the cable port **111** having the largest diameter D1 to the cable port **115** having the smallest diameter D3. Thus, exemplary cable port **113** extends beyond cable port **111**, and cable port **115** extends beyond cable port **113**.

Each pair of successive cable ports **111**, **113** and **115** differ from each other in height by at least the thickness of a blade (shown in FIGS. 7 and 8) used to cut unused ones of the plurality of cable ports from the adapter. The cable ports within each pair of successive cable ports may optionally differ in height from one another by a constant amount. That is, the difference (H1–H2) may be substantially equal to (H2–H3).

Each cable port **111** and **113** (other than the cable port **115** having the smallest diameter) has a distal flat surface **118** and **122** at a distal end opposite the flange **112**. The smallest cable port **115** may have a flat surface **126** that is removed (as shown in FIG. 6) to accommodate a small cable. If the BEP is to be installed with the adapter **100** and maintained in a sealed state before any cables are secured to the BEP, then the flat surface **126** should be present, until the cable is installed. Alternatively, if the cable is to be secured to the BEP at the same time the BEP is installed, then an adapter formed without the flat surface **126** may be used.

Each of the exemplary cable ports **111**, **113** and **115** has a respective ledge **117**, **121** and **125** proximate to the distal end. In the exemplary embodiment, the ledge of an inner one of an adjacent pair of cable ports within the plurality of cable ports is located at the same height as the flat surface at the distal end of the outer one of the pair of cable ports. For example, the ledge **125** of cable port **115** has the same height as the flat surface **122** of cable port **113**. Similarly, ledge **121** of cable port **113** has the same height as the flat surface **118** of cable port **111**.

Preferably, the adapter **100** is formed from a single piece of material. In the exemplary embodiment, the overlapping side walls of each successive pair of cable ports are connected by a connecting portion, including a first flat surface proximal to the flange **112**, a cylindrical wall concentric with the plurality of cable ports, and a second flat surface at a distal end opposite the flange. For example, cable port **113** is connected to cable port **111** by a first flat surface **134** proximal to the flange **112**, a cylindrical wall **132**, and a second flat surface **118** at the distal end opposite the flange. Similarly, cable port **115** is connected to cable port **113** by a first flat surface **138** proximal to the flange **112**, a cylindrical wall **136**, and a second flat surface **122** at the distal end opposite the flange.

The construction described in the preceding paragraph allows the adapter **100** to be formed from a single piece of material, with overlapping cylindrical side walls **116**, **120** and **124** of cable ports **111**, **113** and **115** conveniently connected to one another. Thus, only a single cut is required to prepare the adapter **100** to accept any size of cable (e.g., small, medium or large). At the same time, a low profile can be achieved.

It is possible for the adapter **100** to have a height that is approximately equal to the height H1 of the cable port **111** having the largest diameter. The difference between the heights of successive cable ports (H2–H1, or H3–H2) can be set as small as desired. Preferably, the difference H2–H1 is greater than the thickness of a blade used to cut the unused cable ports from the adapter. Smaller height differences (or no height difference) may be used if the unused portion of the adapter is severed on the distal flat surface **118**, **122**, or **126**, but it would be more difficult to make such a cut using a manual tool, such as a saw, in the field.

A method according to the invention for securing a cable to a housing, includes attaching an adapter **100** to the housing **150**, where the adapter has a plurality of concentric cable ports **111**, **113** and **115**, each cable port has a side wall **116**, **120** and **124**, and the side wall of each cable port overlaps a side wall of an adjacent one of the plurality of cable ports. A portion of a selected one of the cable ports is cut, so as to remove any cable port that is smaller in diameter than the selected cable port, and the cable is secured to the selected cable port. FIGS. 6, 7 and 8 show the three different configurations into which adapter **100** may be cut.

FIG. 6 shows the configuration for securing a small cable (not shown) to the BEP **150** (FIG. 9). Only the flat surface **126** of the small cable port **115** is removed. This is easily accomplished by a circumferential cut between ledge **125** and flat surface **126**.

FIG. 7 shows the configuration for securing a medium cable **128** (FIG. 9) to the BEP **150** (FIG. 9). The small cable port **115** is removed. This is easily accomplished by a circumferential cut between ledge **121** and flat surface **122**. The unused portion of the adapter (including flat surface **126**, side wall **124**, proximal flat surface **138**, connecting cylindrical wall **136** and distal flat surface **122**) is removed in a single piece.

FIG. 8 shows the configuration for securing a large cable (not shown) to the BEP 150 (FIG. 9). The small cable port 115 and medium cable port 113 are removed. This is easily accomplished by a circumferential cut between ledge 117 and flat surface 118. The unused portion of the adapter (including flat surface 126, side wall 124, proximal flat surface 138, connecting cylindrical wall 136, distal flat surface 122, side wall 120, proximal flat surface 134, connecting cylindrical wall 132 and distal flat surface 118) is removed in a single piece.

In an exemplary method, the cutting step includes aligning a blade (such as saw blade 160 shown in FIG. 7) on the flat surface 118 of a cable port 111 adjacent to the selected cable port 113 to be cut, and cutting the selected cable port with the aligned blade. The cutting step may further include aligning the blade 160 on a ledge 121 of the selected cable port 113 and the flat surface 118 of the adjacent cable port 111 simultaneously. As shown in FIG. 7, an advantage of aligning the ledge 121 of a cable port 113 with the distal flat surface 118 of the next larger cable port is the ability to simultaneously rest a cutting blade on both the flat surface 118 and the ledge 121 simultaneously to position, align and steady the blade 160 during cutting.

One of ordinary skill can easily recognize how a similar cutting step may be used for the configuration shown in FIG. 6. A blade 160 can simultaneously be aligned on ledge 125 of cable port 115 and distal flat surface 122 of adjacent cable port 113. In the case of the largest cable port 111 (FIG. 8), the blade 160 may be aligned on the ledge 117, but there is no distal flat surface parallel to ledge 117. If desired, the blade may be aligned on the ledge 117 for cutting.

FIG. 9 shows building entrance protector assembly 200, including a building entrance protector housing 150 having an opening therethrough. An adapter 100 is used for securing a cable 128 to the housing 150. The adapter 100 may be of the type described above. Cold-shrink tubing 130 may be used to form a seal between cable 128 and side wall 120.

Although it is advantageous to cut the plastic at the height of one of the ledges 117, 121 or 125, the adaptor may be cut at a position between the ledge 117, 121 or 125 and the respective distal flat surface 118, 122 or 126 (as shown in FIG. 8). Further, the cut may be made through the distal flat surface 118, 122, or 126, but such a cut is likely to be more difficult to perform, particularly using manual tools in the field.

Once the adapter 100 is cut to the desired configuration corresponding to the diameter of the cable to be used, the cable is inserting through the selected cable port. A cold-shrink tubing is fit over the selected cable port and a portion of the cable protruding therethrough. The core of the cold shrink tubing is removed, so that the tubing collapses to form a seal over the selected cable port and the portion of the cable.

An adapter according to the invention is preferably formed from a single piece of a polymer material, such as polycarbonate or polyvinyl chloride. The material should be rigid, yet easy to cut with a saw or other cutting tool. Although a metal adapter would have the desired rigidity, metal is more difficult to cut with a saw in the field.

Although the exemplary adapter includes three cable ports, it is contemplated that adapters according to the present invention may be formed to include any number of cable ports, by adding additional cylindrical side walls, and connecting proximal and distal flat surfaces.

Although the exemplary proximal flat (connecting) surfaces 134 and 138 (FIG. 8) are not parallel to each other, it is contemplated that an adapter according to the invention may be made in which the proximal connecting surfaces are parallel to each other (not shown).

Although the invention has been described in terms of exemplary embodiments, it is not limited thereto. Rather, the appended claim should be construed broadly, to include other variants and embodiments of the invention which may be made by those skilled in the art without departing from the scope and range of equivalents of the invention.

What is claimed is:

1. An adapter for securing a cable to a housing, comprising:

a flange that is attachable to the housing; and

a plurality of concentric cable ports connected to the flange, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports, wherein:

each cable port has a respective diameter and a respective height with respect to the flange,

the heights of the cable ports increase as the diameters of the cable ports decrease,

each cable port other than the cable port having the smallest diameter has a flat surface at a distal end opposite the flange,

one of the cable ports other than the cable port having the largest diameter has a ledge proximate to the distal end, said one of the cable ports being an inner one of an adjacent pair of cable ports within the plurality of cable ports; and

the ledge of said inner one is located at the same height as the flat surface at the distal end of an outer one of the pair of cable ports.

2. The adapter of claim 1, wherein:

each cable port has a ledge proximate to the distal end; and

the ledge of an inner one of any adjacent pair of cable ports within the plurality of cable ports is located at the same height as the flat surface at the distal end of an outer one of the pair of cable ports.

3. The adapter of claim 1, wherein the side wall of each cable port is rigid.

4. The adapter of claim 1, wherein the side wall of each cable port is fixed.

5. The adapter of claim 1, wherein the plurality of cable ports includes at least one pair of successive cable ports, and the cable ports within each pair of successive cable ports differ from each other in height.

6. The adapter of claim 5, wherein each pair of successive cable ports differ from each other in height by a constant amount.

7. The adapter of claim 1, wherein at least one of the cable ports is connected to an adjacent one of the cable ports by a first flat surface proximal to the flange, a cylindrical wall concentric with the plurality of cable ports, and a second flat surface at a distal end opposite the flange.

8. An adapter for securing a cable to a housing, comprising:

a flange that is attachable to the housing; and

a plurality of concentric cable ports connected to the flange, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports,

wherein at least one of the cable ports is connected to an adjacent one of the cable ports by a first flat surface

proximal to the flange, a cylindrical wall concentric with the plurality of cable ports, and a second flat surface at a distal end opposite the flange.

9. The adapter of claim 8, wherein:

each cable port has a respective diameter and a respective height with respect to the flange, and

the heights of the cable ports increase as the diameters of the cable ports decrease.

10. The adapter of claim 8, wherein more than one of said plurality of cable ports are connected to a respective adjacent one of the cable ports by a respective first flat surface proximal to the flange, a respective cylindrical wall concentric with the plurality of cable ports, and a respective second flat surface at a distal end opposite the flange.

11. The adapter of claim 8, wherein the adapter is formed from a single piece of material.

12. A building entrance protector assembly, comprising:

a building entrance protector housing having an opening therethrough; and

an adapter for securing a cable to the housing, the adapter comprising:

a flange that is attachable to the housing; and

a plurality of concentric cable ports connected to the flange, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports, wherein:

each cable port has a respective diameter and a respective height with respect to the flange,

the heights of the cable ports increase as the diameters of the cable ports decrease,

each cable port other than the cable port having the smallest diameter has a flat surface at a distal end opposite the flange,

one of the cable ports other than the cable port having the largest diameter has a ledge proximate to the distal end, said one of the cable ports being an inner one of an adjacent pair of cable ports within the plurality of cable ports; and

the ledge of said inner one is located at the same height as the flat surface at the distal end of an outer one of the pair of cable ports.

13. The building entrance protector of claim 12, wherein:

each cable port has a ledge proximate to the distal end; and

the ledge of an inner one of any adjacent pair of cable ports within the plurality of cable ports is located at the same height as the flat surface at the distal end of an outer one of the pair of cable ports.

14. The assembly of claim 12, wherein the side wall of each cable port is rigid.

15. The assembly of claim 12, wherein the side wall of each cable port is fixed.

16. The assembly of claim 12, wherein at least one of the cable ports is connected to an adjacent one of the cable ports by a first flat surface proximal to the flange, a cylindrical wall concentric with the plurality of cable ports, and a second flat surface at a distal end opposite the flange.

17. The assembly of claim 12, wherein the plurality of cable ports includes at least one pair of successive cable ports, and the cable ports within each pair of successive cable ports differ from each other in height.

18. The assembly of claim 12, wherein each pair of successive cable ports differ from each other in height by a constant amount.

19. A building entrance protector assembly, comprising:

a building entrance protector housing having an opening therethrough; and

an adapter for securing a cable to the housing, the adapter comprising:

a flange that is attachable to the housing; and

a plurality of concentric cable ports connected to the flange, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports,

wherein at least one of the cable ports is connected to an adjacent one of the cable ports by a first flat surface proximal to the flange, a cylindrical wall concentric with the plurality of cable ports, and a second flat surface at a distal end opposite the flange.

20. The building entrance protector assembly of claim 19, wherein more than one of said plurality of cable ports are connected to a respective adjacent one of the cable ports by a respective first flat surface proximal to the flange, a respective cylindrical wall concentric with the plurality of cable ports, and a respective second flat surface at a distal end opposite the flange.

21. The assembly of claim 19, wherein the adapter is formed from a single piece of material.

22. The assembly of claim 19, wherein:

each cable port has a respective diameter and a respective height with respect to the flange, and

the heights of the cable ports increase as the diameters of the cable ports decrease.

23. A method for securing a cable to a housing, comprising the steps of:

(a) attaching an adapter to the housing, the adapter having a plurality of concentric cable ports, each cable port having a side wall, the side wall of each cable port overlapping a side wall of an adjacent one of the plurality of cable ports, wherein:

each cable ports other than the cable port having the smallest diameter has a flat surface at a distal end opposite the flange, and

each cable port has a ledge proximate to the distal end;

(b) aligning the blade on the ledge of the selected cable port and the flat surface of the adjacent cable port simultaneously;

(c) cutting a portion of the selected one of the cable ports with the aligned blade, so as to remove any cable port that is smaller in diameter than the selected cable port; and

(d) securing the cable to the selected cable port.

24. The method of claim 23, wherein step (d) includes:

inserting the cable through the selected cable port;

fitting a cold-shrink tubing over the selected cable port and a portion of the cable protruding therethrough; and

removing a core of the cold shrink tubing, so that the tubing collapses to form a seal over the selected cable port and the portion of the cable.

25. The method of claim 23, wherein the side wall of each cable port is rigid.

26. The method of claim 23, wherein the side wall of each cable port is fixed.

* * * * *

US006591561B1

(12) **United States Patent**
Evensen

(10) **Patent No.: US 6,591,561 B1**
(45) **Date of Patent: Jul. 15, 2003**

(54) **WATERPROOF ROOF DECK POST CONSTRUCTION**

(76) Inventor: **Lawrence P. Evensen**, 29254 Greenwater Rd., Malibu, CA (US) 90265

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/240,807**

(22) Filed: **Feb. 1, 1999**

(51) **Int. Cl.**[7] **E04H 12/28**
(52) **U.S. Cl.** **52/199**; 52/219; 52/58; 52/60; 285/42
(58) **Field of Search** 52/199, 58, 59, 52/60, 219; 285/83, 82, 42

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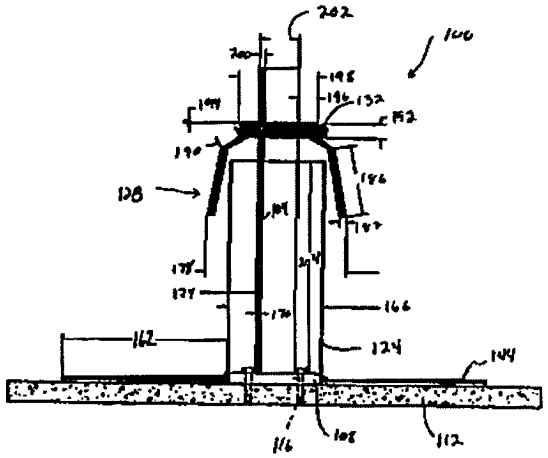
Primary Examiner—Carl D. Friedman
Assistant Examiner—Jennifer I. Thissell
(74) *Attorney, Agent, or Firm*—Oppenheimer Wolff & Donnelly LLP

(57) **ABSTRACT**

A deck post (or brace) having a non-circular cross-section is secured in place by bolting its mounting bracket to the roof deck. A lead pipe jack is slid over the post, and its lower flange is nailed to the deck. A waterproofing assembly having a collar and a skirt is provided; the collar has an opening with generally the same non-circular cross-section as that of the post. The collar opening is positioned on the deck post, and the unit is slid down the post until the collar is at the top of the lead pipe jack and the skirt extends down over it. A stainless steel hose clamp is then positioned and tightened around the collar to provide a watertight seal on the deck post. When the post is already installed on a roof deck and the jack and the waterproofing assembly cannot be slid into place on the post, a modified waterproofing assembly and jack are used to provide the waterproofing. The modified jack is a prior art split lead flashing jack with an open seam on one side. The jack is opened up, wrapped around the post and soldered closed. The modified waterproofing assembly has a split joint through the skirt and collar. To position this assembly on the post at the top of the split lead flashing jack, the joint is opened up, the assembly wrapped around the post and the slip joint closed with a watertight flap. A snap-fit closure can be provided. A further alternative waterproofing assembly forms the collar as a plug separate from the skirt; the skirt is opened and the plug inserted therein. This arrangement allows a plug having the desired opening configuration to be selected from an inventory of different plugs and used with a single skirt design.

21 Claims, 15 Drawing Sheets



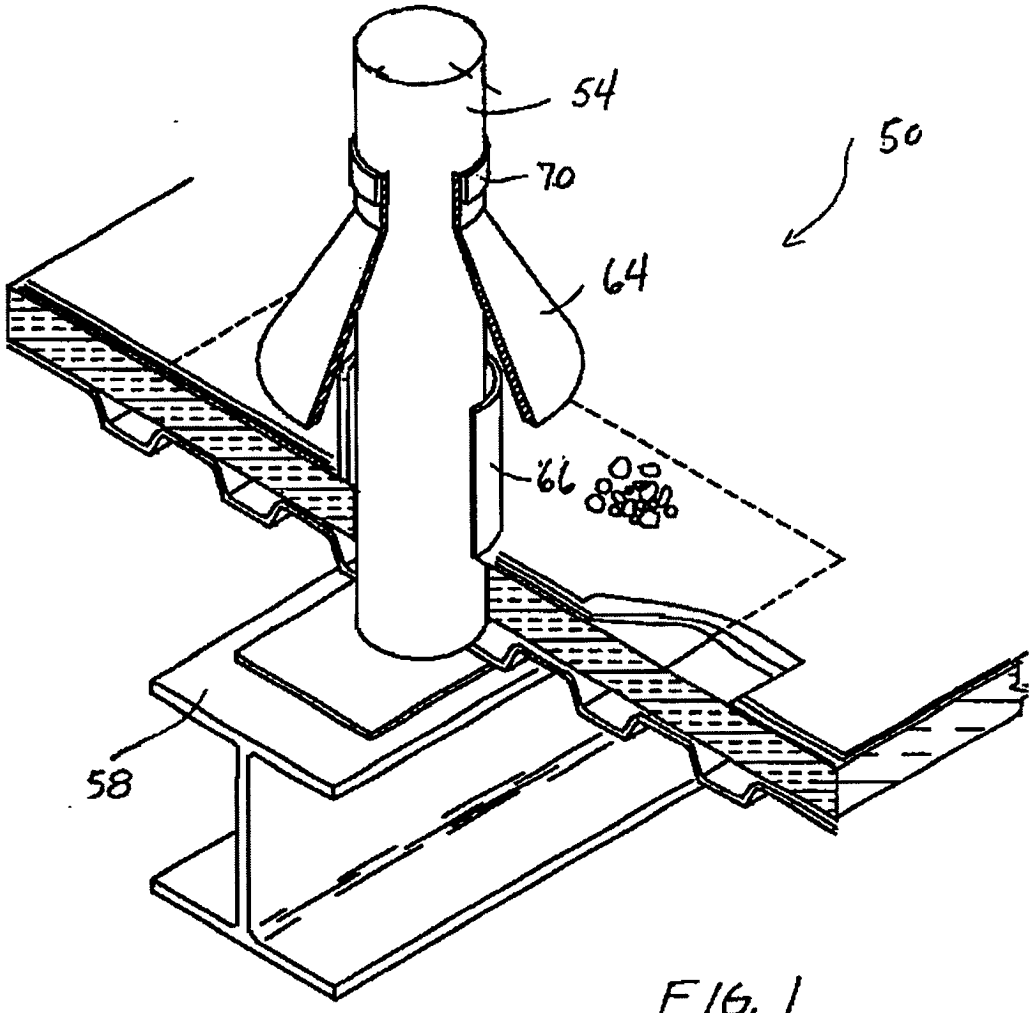


FIG. 1
(PRIOR ART)

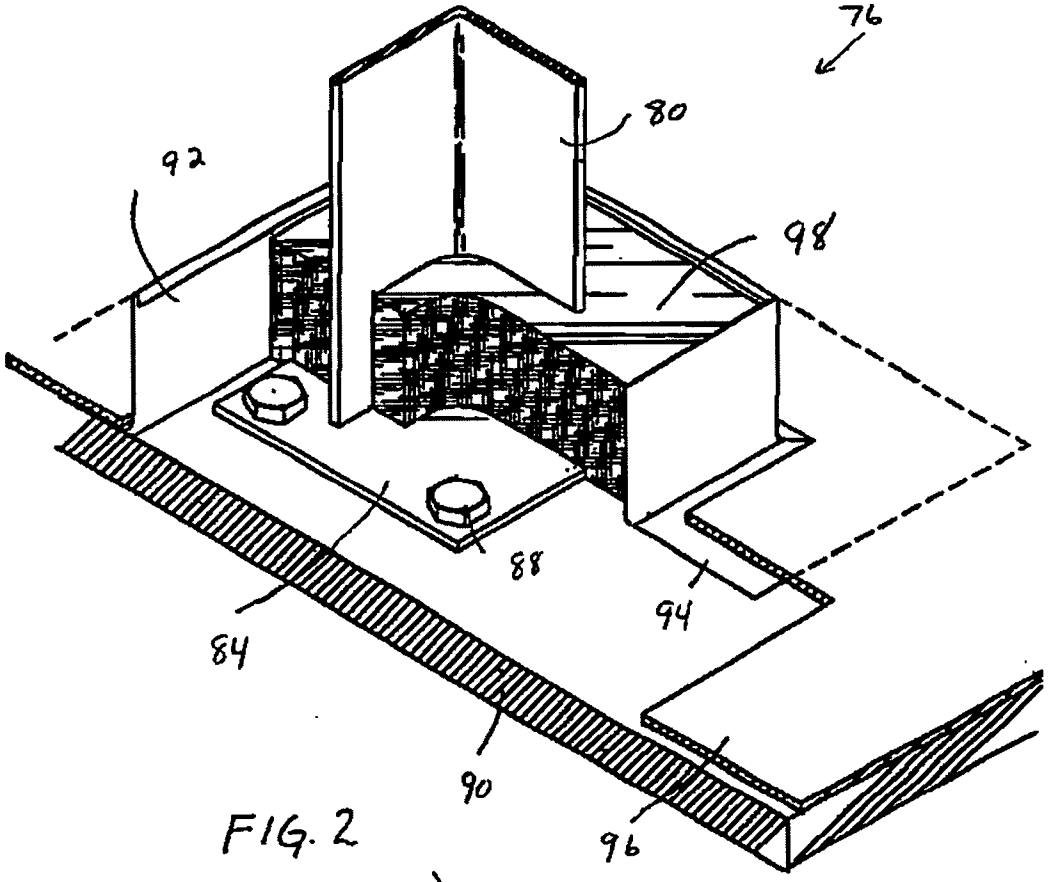


FIG. 2
(PRIOR ART)

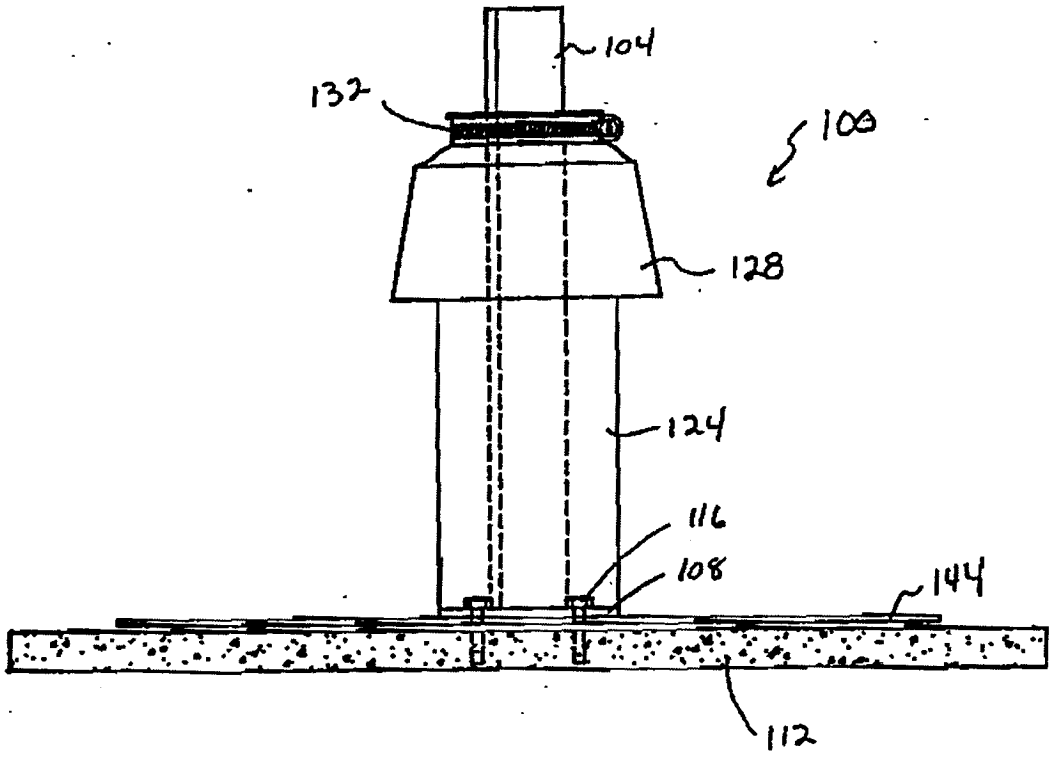


FIG. 3

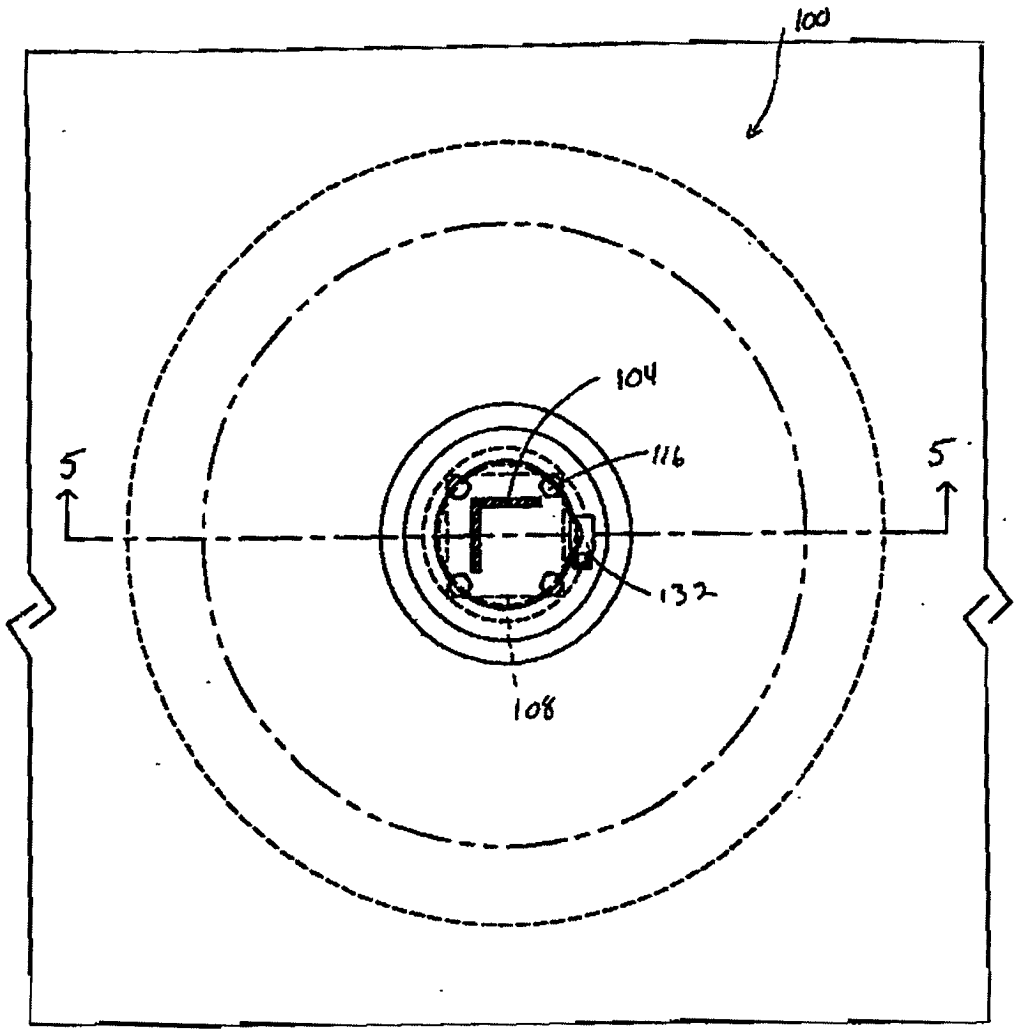


FIG 4

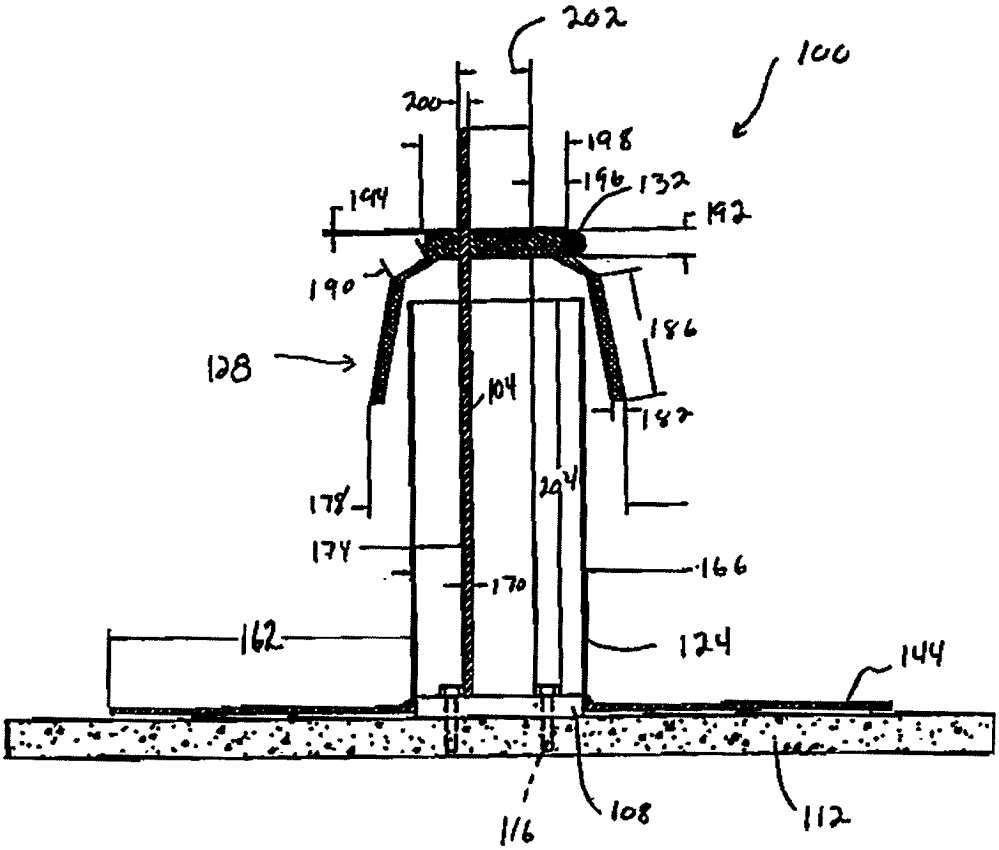

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FIG. 5

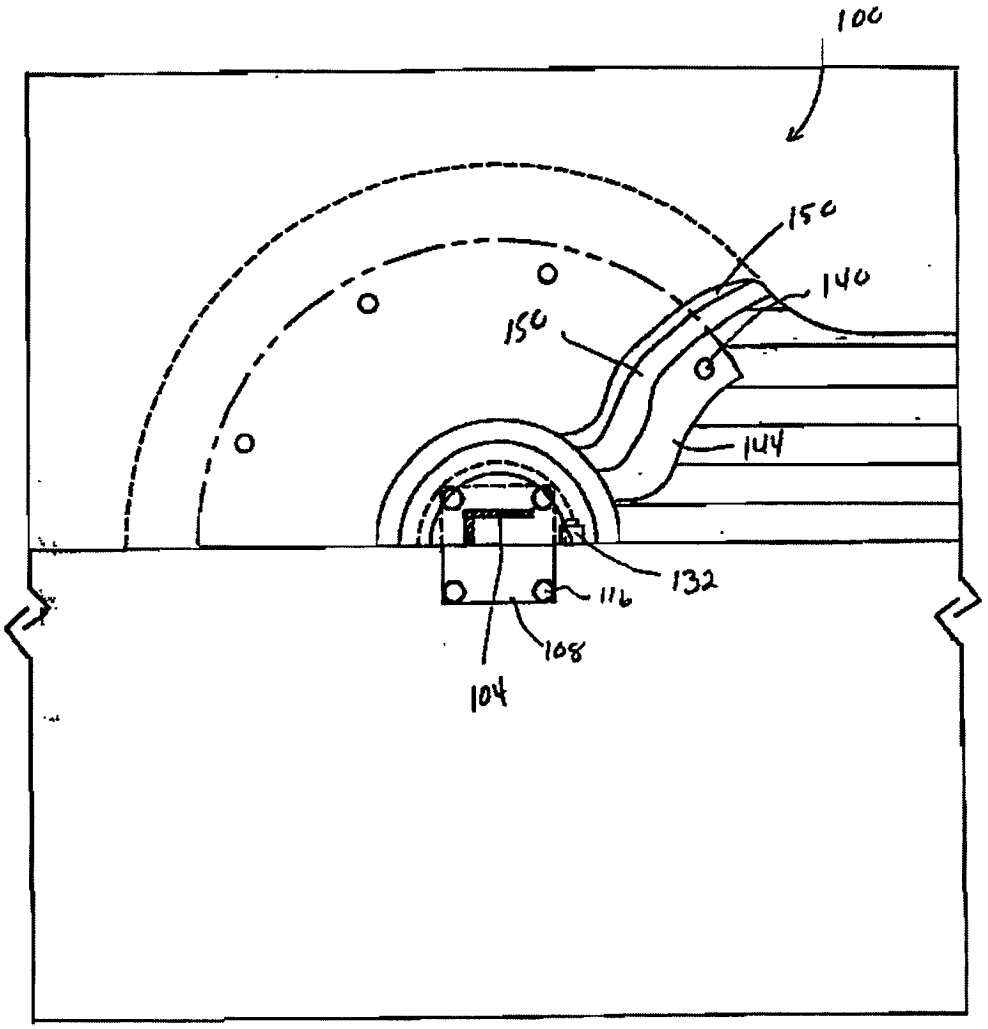

FIG. 6

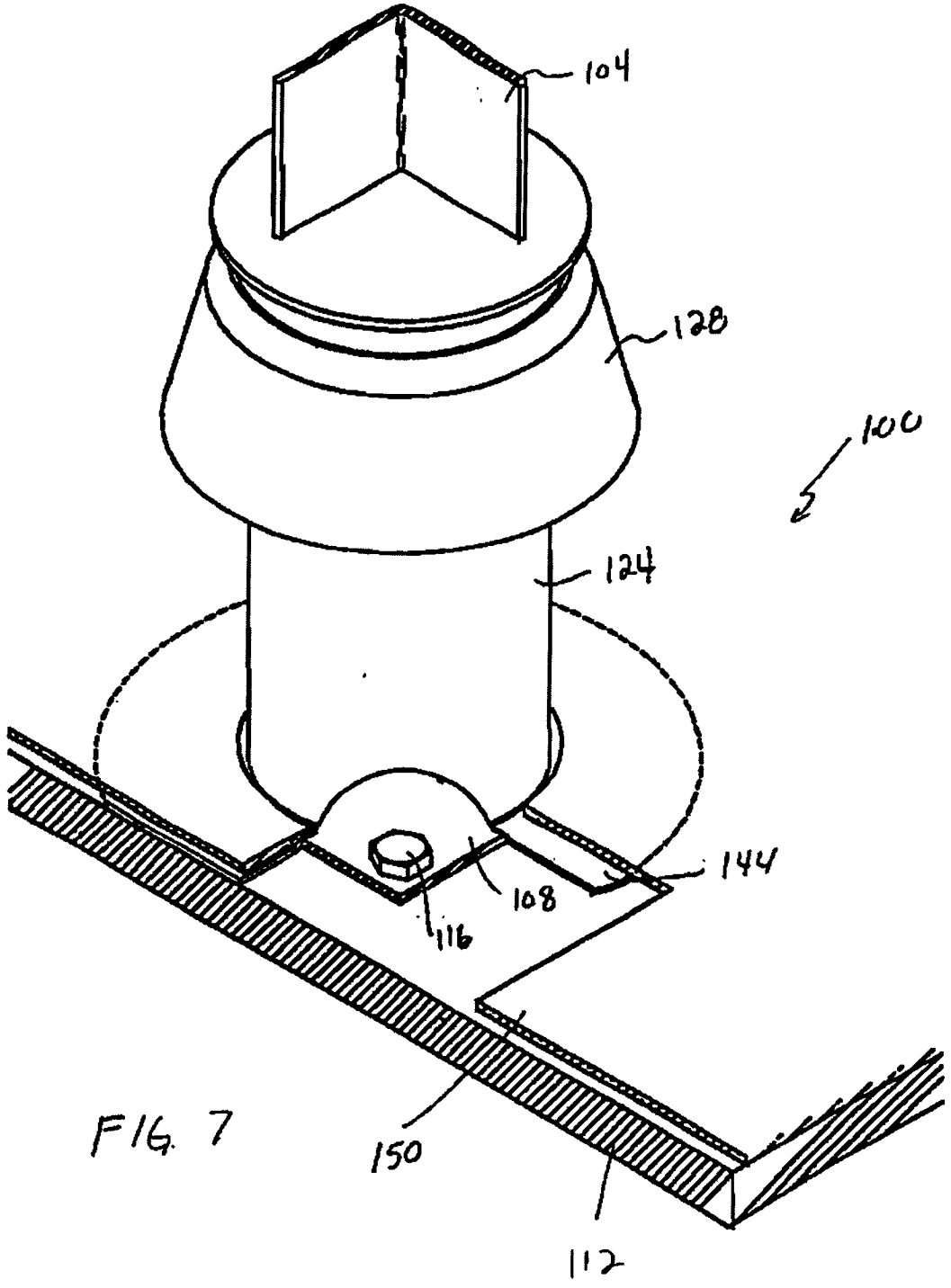

FIG. 7

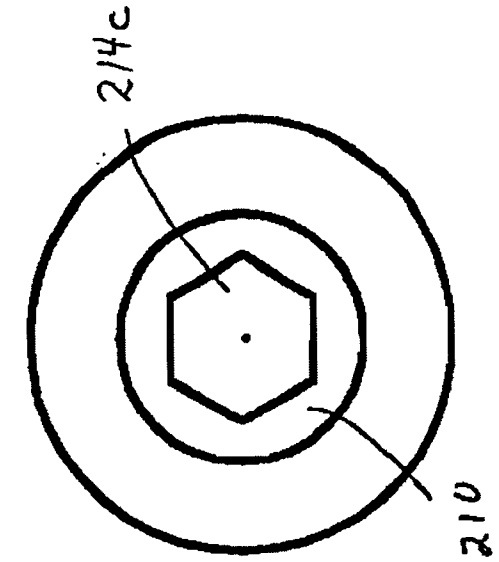

FIG. 8C

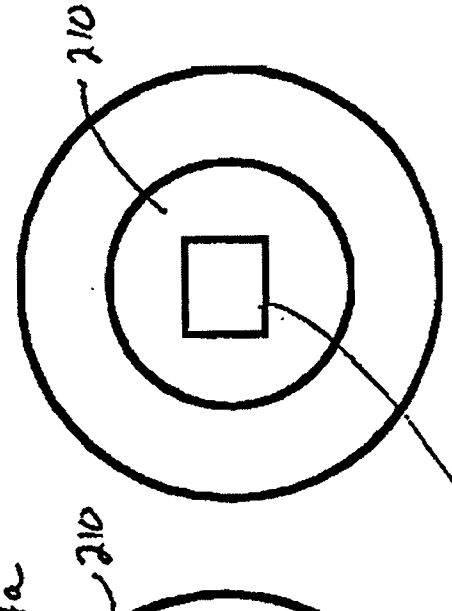

FIG. 8B

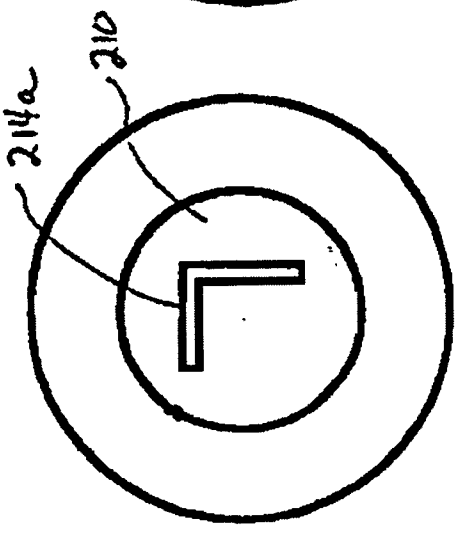

FIG. 8A

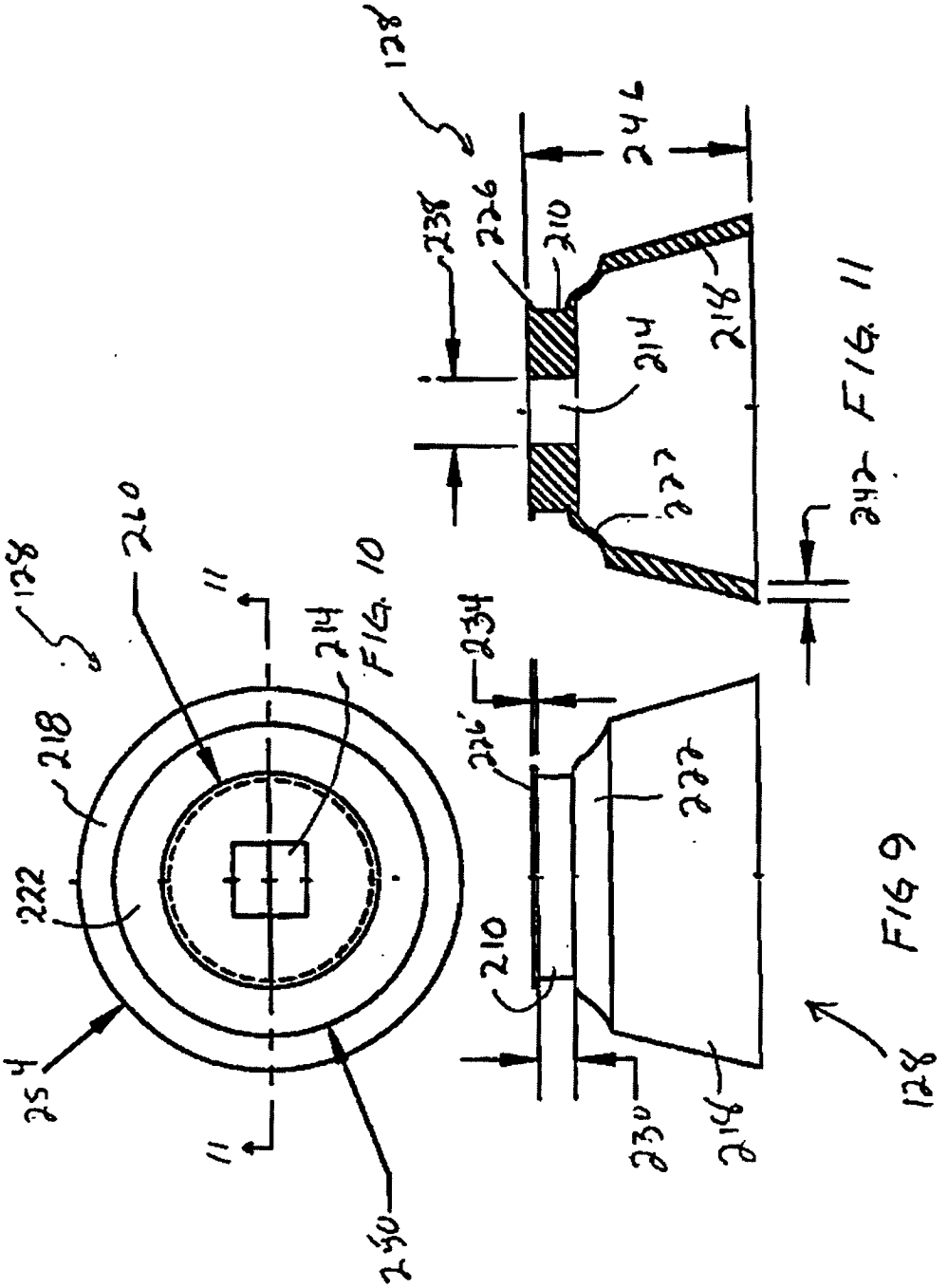
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FIG. 11
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FIG 9

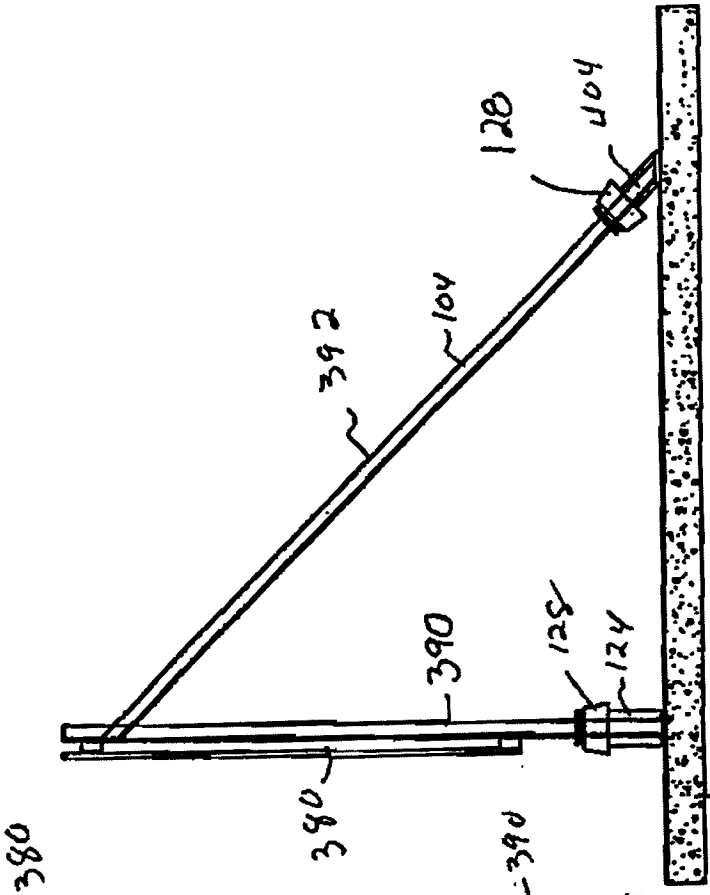
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FIG. 13

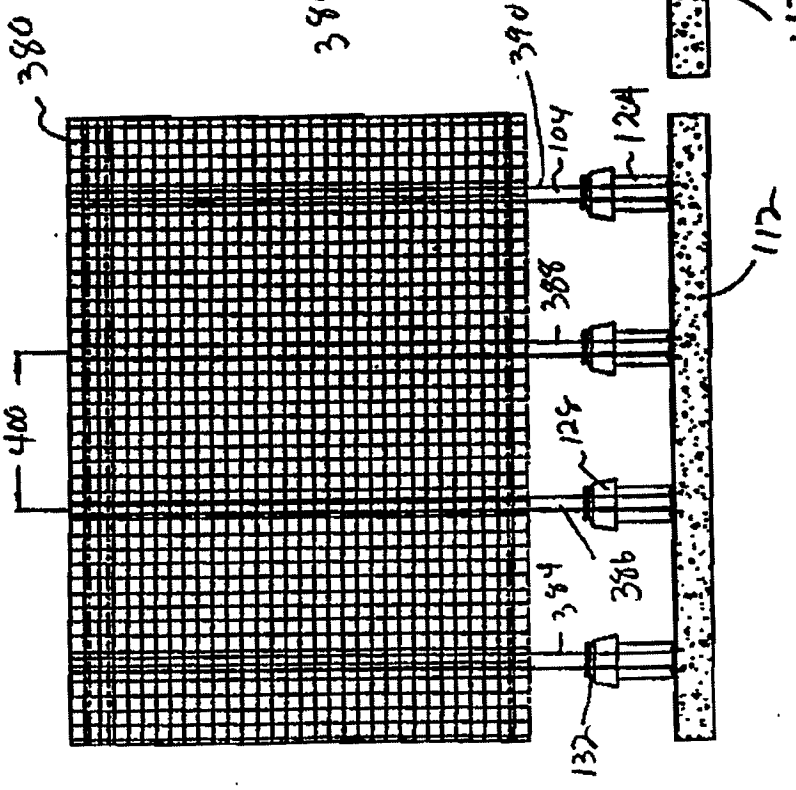
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FIG. 12

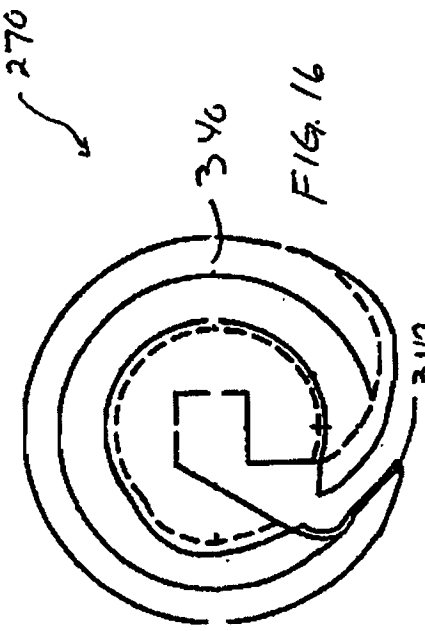

FIG. 16

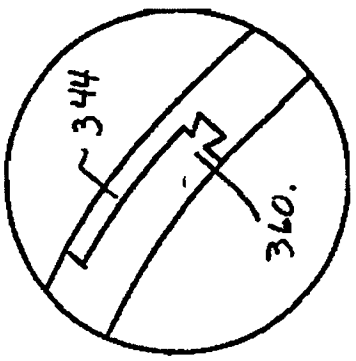

FIG 17

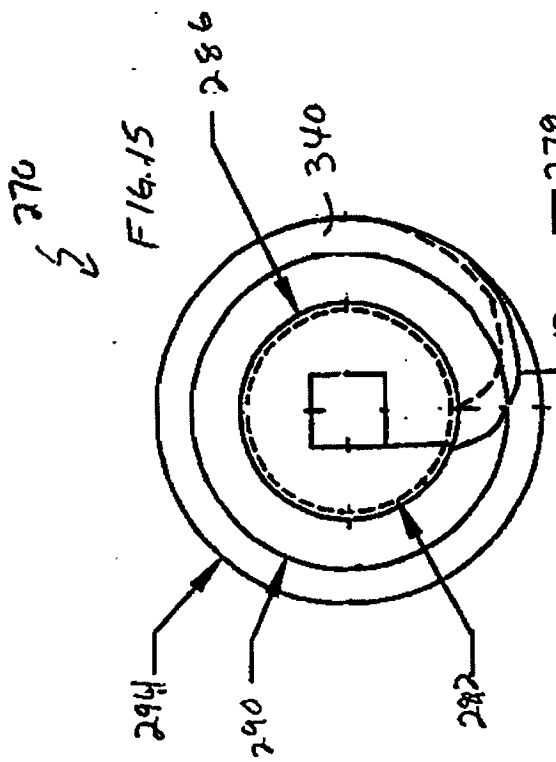

FIG. 15

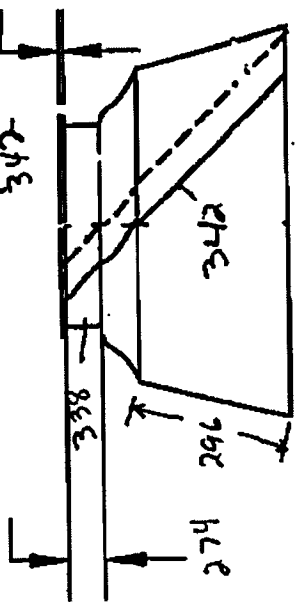

FIG 14

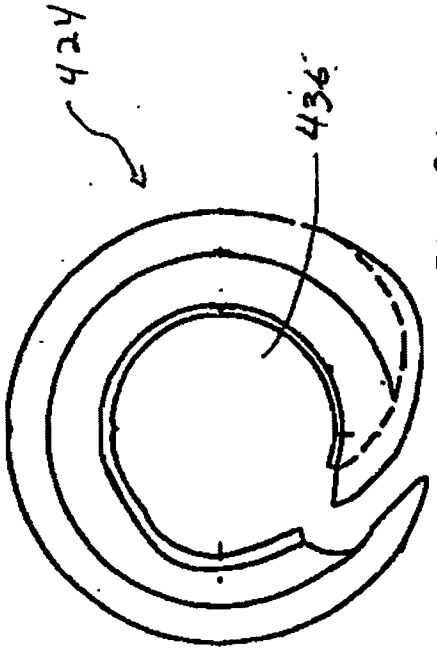

FIG. 21

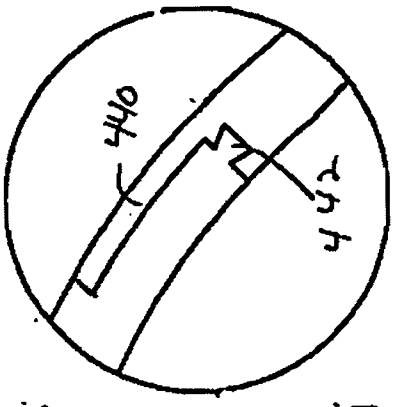

FIG. 22

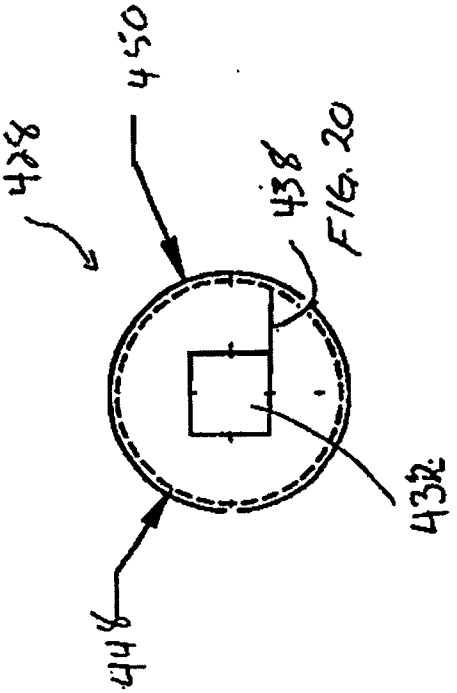

FIG. 20

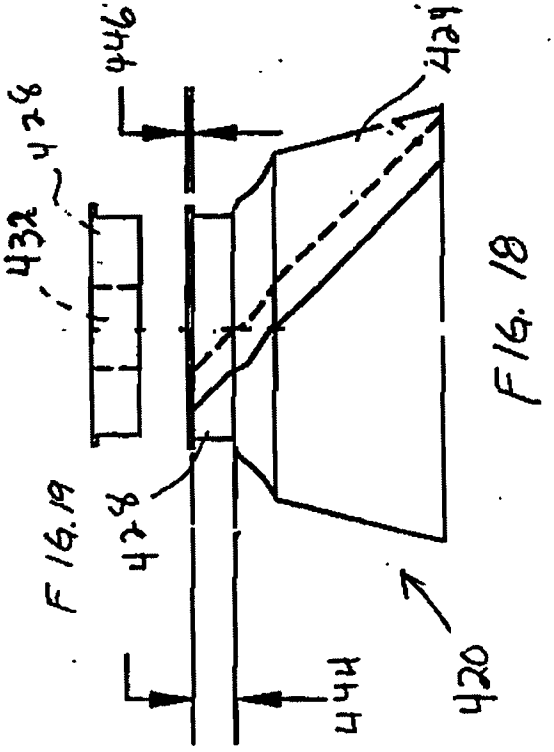

FIG. 19

FIG. 18

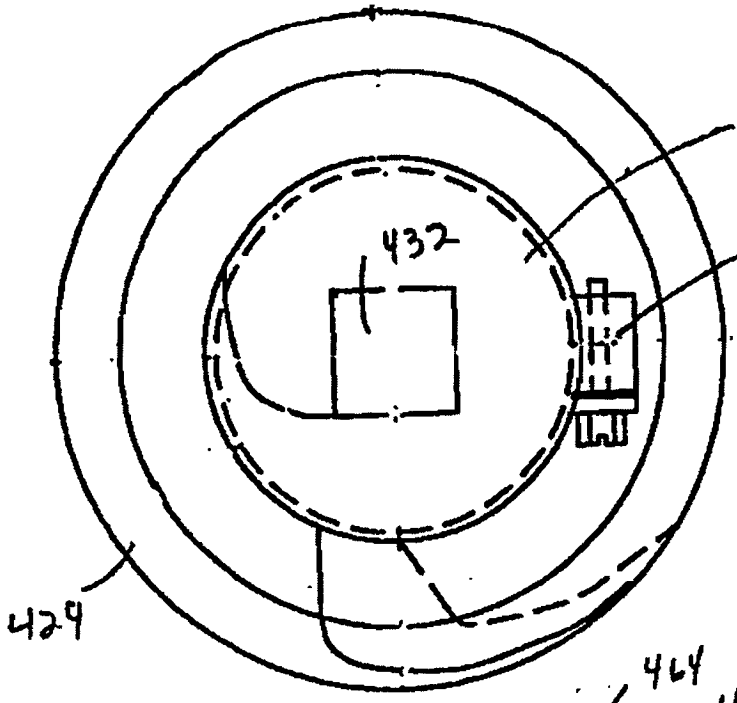

FIG. 24

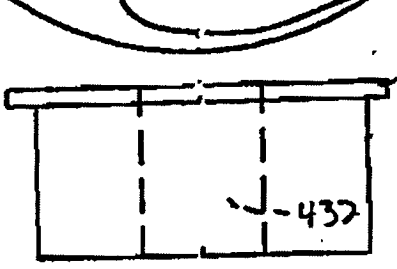

FIG. 25

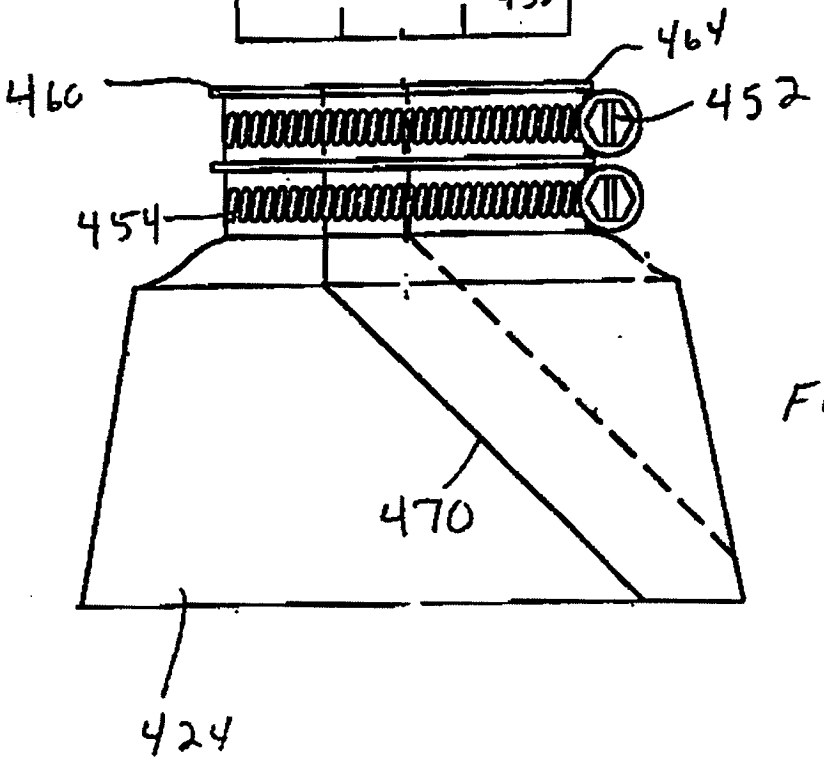

FIG. 23

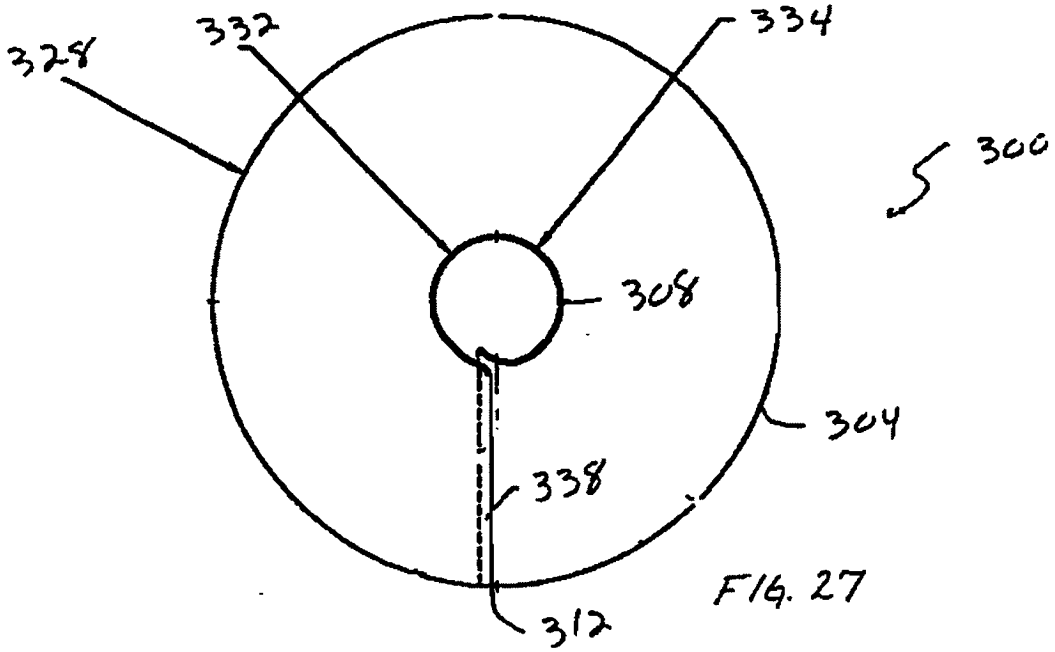

FIG. 27

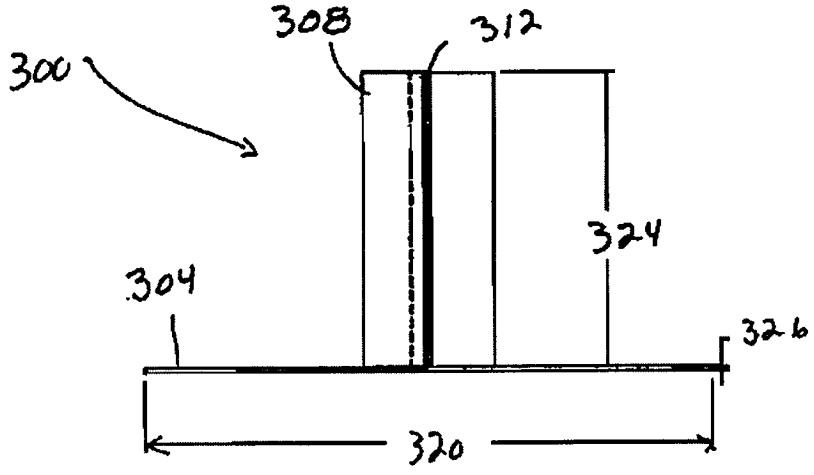

FIG. 26

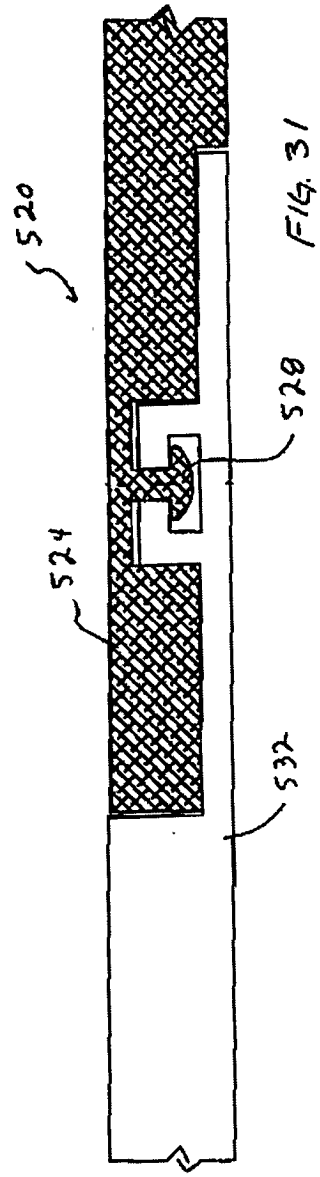

FIG. 31

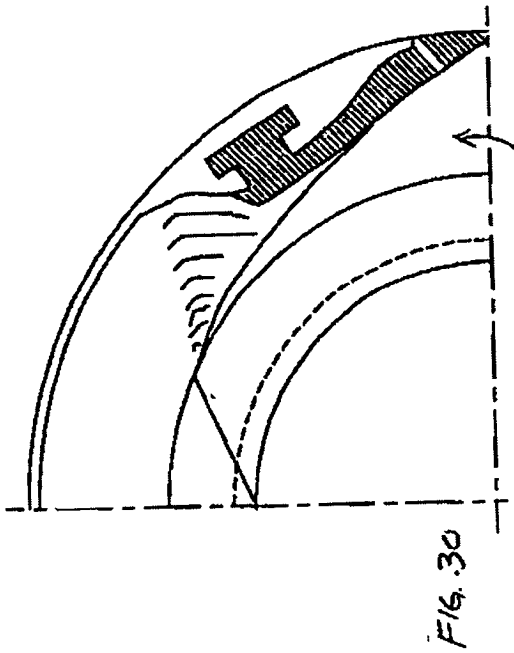

FIG. 30

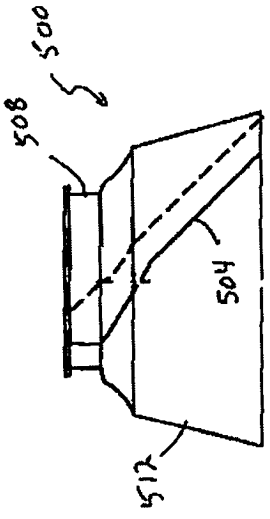

FIG. 28

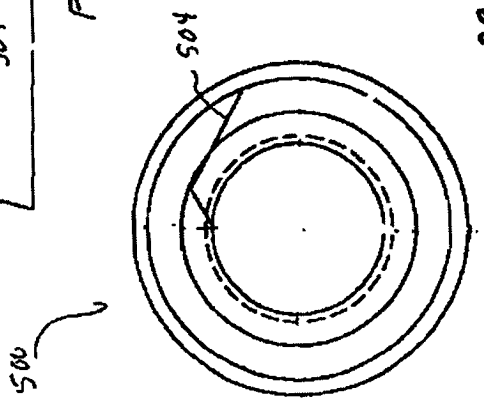

FIG. 29

WATERPROOF ROOF DECK POST CONSTRUCTION

BACKGROUND OF THE INVENTION

The present invention relates to constructions and methods for installing and waterproofing roof deck posts, and particularly those having non-circular cross-sections.

The tops of buildings or roof decks are often used to mount various items, which typically support the use or function of the building or benefit the building's occupants in some way. These items include signs, fences, helicopter landing zones, equipment supports and even swimming pools.

When a fence, for example, is installed on top of a building, it must be installed securely so that it will not fall or blow off of the building. Additionally, the support members or posts of the fence must be attached in such a way as to maintain the water integrity of the roof. If the fence supports are bolted into the roof deck, each support will cut through or penetrate the building roof jeopardizing the water integrity of the roof unless adequate waterproofing measures are taken.

A waterproofing construction of the prior art used when the support or post is round is shown in FIG. 1 generally at **50**. Referring thereto, the round post **54** is secured to structural framing **58**, and is provided to support another structure such as fencing or a structural frame. An umbrella overlapping jack **64** is used to waterproof the support. The pipe jack **64** is a cone that fits snugly around the penetration and creates a waterproof seal above the roof line. FIG. 1 shows a sheet metal roof jack **66** extending at least eight inches above the roofing, and the umbrella pipe jack **64** overlaps the roof jack by a radius of three to four inches. A drawband **70** secures the upper collar portion of the pipe jack **64** to the round post **54**, and caulk with sealant is applied around the top circumference. Construction **50** works where the projection or post is round; however, if the post is other than round, the pipe jack does not fit snugly and leaks result.

Thus, for other than round posts, another waterproofing construction is used, an example of which is depicted in FIG. **2** and is commonly referred to as "Pitch Pocket." This term describes the encasing of an odd-shaped penetration (such as a steel angle iron support) in a pool of asphalt that is held in a metal bowl mounted onto the roof. When the asphalt dries or cools the penetration located inside of it is tightly encased to prevent water penetrating into the building.

Referring to FIG. **2**, a method of installing the Pitch Pocket will now be described with the construction being shown generally at **76**. A steel angle iron brace (support or post) **80** with a four hole mounting plate **84** welded thereto is bolted with bolts **88** to a roof deck **90**. A sheet metal contractor slides a four-sided metal pitch pan **92** over the top of the brace **80**. The pan **92**, which is at least two inches deep, hangs loose waiting for a later installation step. The roofing contractor installs first ply layers (typically three) of roofing materials under the pitch pan **92** and onto the entire building roof. He then nails the flange **94** of the pan **92** onto the roof deck and through the ply layers. Roofing plies will be striped or layered over the flange **94** to laminate the flange between the roofing plies. A finish coat of roofing materials **96**, such as gravel or granule rolled roofing, is installed. Hot asphalt **98** or other pourable sealer is then poured into the pitch pan **92** until full and with a minimum two inch depth, and the asphalt is allowed to cool.

Pitch Pockets (**76**) work well until the asphalt shrinks or cracks and the pan or concave bowl fills with water. This

cracking can be caused by the sun's direct heat, by impact on the post construction, by strong winds or by the building shaking as from an earthquake. When the cracks form the water in the pocket is funneled into the building, resulting in the problem which the pitch pocket was specifically provided to prevent. Also, since the post is fixed in place by the asphalt, when a strong force is exerted on the post, the asphalt around the post compresses, loosening the securement of the post relative to the roof, and requiring repair.

SUMMARY OF THE INVENTION

Directed to remedying the problems and disadvantages of the prior art, disclosed herein are an improved waterproof deck post construction and method and a waterproofing assembly (or watertight umbrella) useful therein. The assembly has a collar with an opening therethrough and a skirt hanging down from the collar. The opening is configured to match the cross-sectional shape of the deck post, and this invention is thereby particularly well suited for deck posts which are not round. The assembly is preferably an elastomeric material or specifically is EPDM molded rubber.

The post is secured to the roof deck. A flanged sleeve is slid over the post and the flange secured to the roof deck. The flanged sleeve can be a lead jack such as are used today on stink pipes and vent pipes. The waterproofing assembly is slid onto the post. With the collar surrounding the post just above the top of the sleeve and the skirt extending down over the top of the sleeve, a band is secured around the collar securing the collar in a watertight manner to the post. The band is preferably a hose clamp.

When the post is already secured to the deck and it is not convenient to slide the waterproofing assembly down over the post, an alternative embodiment of the waterproofing assembly of this invention is used. This embodiment has a split joint through the skirt and the collar which allows the unit to be opened up and wrapped around the post. A watertight flap of the unit seals the joint closed. In this construction, a split lead flashing jack can be used as the flanged sleeve. The flashing jack is opened up and wrapped around the post and its seam then soldered closed.

The shape of the opening of the collar is selected to match the shape of the outside surface of the post. For example, it can be an L or a square shape. The skirt can have the same configuration for all post shapes. Thus, another embodiment of the waterproofing assembly constructs the skirt and collar as separate pieces with an inventory of collars having different opening shapes provided. The collar with the desired opening shaped to match the post being used will be selected and plugged into the skirt. In other words, the detachable EPDM collars or inserts are interchangeable to allow various geometric shapes. This plug-type collar and skirt can have split joints allowing them to be wrapped around the post. Additionally, the collar can have a longer configuration to accommodate two hose clamps, one above the other, if desired.

Other objects and advantages of the present invention will become more apparent to those persons having ordinary skill in the art to which the present invention pertains from the foregoing description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective cut-away view of a round post roof-mounted construction of the prior art;

FIG. 2 is a perspective cut-away view of an angle iron brace roof-mounted ("Pitch Pocket") construction of the prior art;

FIG. 3 is a side elevational view of a waterproof roof deck construction of the present invention;

FIG. 4 is an enlarged top plan view of the construction of FIG. 3;

FIG. 5 is a reduced cross-sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is an enlarged top plan view of FIG. 5;

FIG. 7 is a perspective, partially cut-away view of the construction of FIG. 3, but without the hose clamp for illustrative purposes;

FIG. 8*a* is a top plan view of the waterproofing assembly of the construction of FIG. 7;

FIGS. 8*b* and 8*c* are first and second alternative designs, respectively, of the unit of FIG. 8*a* to accommodate posts of different corresponding cross-section configurations;

FIG. 9 is a side elevational view of an alternative waterproofing assembly of the present invention usable in the construction of FIG. 3, for example;

FIG. 10 is a top plan view of the unit of FIG. 9;

FIG. 11 is a cross-sectional view taken on line 11—11 of FIG. 10;

FIG. 12 is a side elevational view of a construction assembly of the present invention used to support rooftop fencing or screening structure;

FIG. 13 is a side elevational view of the assembly of FIG. 12;

FIG. 14 is a view similar to FIG. 9 illustrating an open seam waterproofing assembly of the present invention;

FIG. 15 is a top elevational view of the unit of FIG. 14;

FIG. 16 is a view similar to FIG. 15 illustrating the unit in an open position;

FIG. 17 is an enlarged view illustrating a portion of the seam of FIG. 14;

FIG. 18 is a view similar to FIG. 14 illustrating an alternative waterproofing assembly of the present invention;

FIG. 19 is a side elevational view of the plug of the assembly of FIG. 18;

FIG. 20 is a top plan view of the plug of FIG. 19;

FIG. 21 is a top plan view of the assembly of FIG. 18 without the plug and in an open position;

FIG. 22 is an enlarged view of a portion of the seam of FIG. 18;

FIG. 23 is a side elevational view of another alternative waterproofing assembly of the present invention similar to that of FIG. 18 but with a detachable plug configured to accommodate two hose clamps as shown;

FIG. 24 is a top plan view of the unit of FIG. 23 with the hose clamps;

FIG. 25 is a side elevational view of the plug of the unit of FIG. 23 illustrated in isolation;

FIG. 26 is a side elevational view of a split lead pipe jack usable with the waterproofing assemblies of FIGS. 14, 18 and 23, for example, in a waterproof roof deck construction like that of FIG. 3;

FIG. 27 is a top plan view of the split lead pipe jack of FIG. 26;

FIG. 28 is a view similar to FIG. 14 of an alternative assembly;

FIG. 29 is a bottom plan view of the assembly of FIG. 28;

FIG. 30 is an enlarged, sectional bottom view of the slip joint of the assembly of FIG. 22; and

FIG. 31 is cross-sectional view of the snap-in slip joint.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF THE INVENTION

Referring to the drawings, a waterproof roof deck post construction of the present invention is illustrated generally at **100**. The method of constructing it is quick and easy. The steel contractor bolts the post **104** with a four-hole mounting bracket **108** welded thereto to the roof deck **112** using bolts **116**. The post **104** can have generally any cross-sectional shape (unlike the prior art of FIG. 2) including non-round shapes. An "L" shape is illustrated by post **104**, which more specifically is an angle iron brace. The steel contractor then slides a lead pipe jack **124**, a waterproofing assembly **128** of the present invention and a stainless steel hose clamp **132** over the top of the brace or post **104** and lets them fall to the deck for later installation.

Next, the roofing contractor installs roofing plies (typically three plies) over the entire building. He nails with nails **140** (FIG. 6) the flange **144** of the lead pipe jack **124** through the ply layers and into the roof deck **112**. The lead pipe jack **124** will typically have a three or four inch diameter and a four pound lead thickness. Instead of a lead jack, a cheaper standard galvanized steel roof jack can be used. Roofing plies **150** are stripped over the flange **144** thereby laminating the flange into the roof system. The finish layer of roofing materials (such as gravel or granule roll roofing) are installed over the ply layers.

The roofing contractor then slides the waterproofing assembly **124** over the leak flashing with its cone shape facing down. The stainless steel hose clamp **132** is placed in position on the waterproofing assembly and the clamp **158** tightened down. FIG. 5 shows dimensions **162, 166, 170, 174, 178, 182, 186, 190, 192, 194, 196, 198, 200, 202, 204** of 6.27, 3.64, 0.20, 0.07, 5.27, 0.25, 2.54, 0.80, 0.53, 0.07, 0.75, 3.04, 0.20, 1.50, and 7.87 inches, respectively. These are just sample dimensions, however, and it is within the scope of the invention to change dimensions, style, materials and heights above the roof deck as would be apparent to those skilled in the art.

The waterproofing assembly **128** is shown in isolation in FIGS. **9**, 10 and 11. It is seen therein that it has a collar portion **210** having an opening **214** therethrough, a downwardly-depending skirt **218**, a shoulder **222** connecting the collar with the skirt, and a top rim or flange **226**. These components according to one embodiment of this invention are integrally formed of EPDM molded rubber in a thermal process. This elastomeric construction allows the collar portion **210** to be squeezed by the hose clamp **132** to secure in a watertight manner the collar to the post **104**, preventing water from leaking between the opening and the post. Sample dimensions **230, 234, 238, 242, 246, 250, 254** and **260**, 0.51, 0.06, 1.00, 0.25, 3.11, R2.15, R2.63 and R1.50 inches, respectively, are shown in these figures.

The opening **214** will be configured to have the same shape as the cross-section of the post (brace) **104** to which it is to be attached. Common shapes for the openings **214** are illustrated in FIGS. 8*a*, 8*b* and 8*c* as L shaped, square and hexagonal, respectively, at **214***a*, **214***b* and **214***c*.

If a post **104** (angle iron or other shaped brace) is already on a building and the waterproofing assembly **128** cannot be slid into position, a retrofit waterproofing assembly of this invention can be used as depicted in FIGS. **14–16** generally at **270**. It has dimensions **274, 278, 282, 286, 290, 294** and **296** of 0.51, 0.06, R1.38, R1.50, R2.15, R2.63 and 2.10 inches, respectively. It is used together with a split lead flashing jack (which is a commercially available product) as illustrated generally at **300** in FIGS. 26 and 27. As shown in

FIGS. 26 and 27, the split lead flashing jack 300 has a bottom flange 304 at the bottom of the sleeve 308, and an open seam 312 extends all of the way down the side. The split lead jack 300 can be a standard jack which is cut at the site to allow installation or it can be a special pre-cut jack. The split lead jack 300 has preferred dimensions 320, 324, 326, 328, 332 and 334 of 15.50, 8.00, 0.125, R7.750 and R1.750, R1.813 inches, respectively.

The lead jack 300 is pulled open and wrapped around the existing support post (104). The lead metal of the jack 300 is soft enough to allow the jack to be opened and closed without using a separate hinge. The open seam 312 is then silver soldered closed with a propane torch. Lead, material 338 overlaps to facilitate soldering.

Similar to construction 100, the roofing contractor installs his ply sheets and the flange 304 of the lead jack 300 is nailed through the ply sheets to the roof deck. Extra ply sheets are stripped over the flange to laminate it into the roof systems. The finish layer of roofing materials are installed onto the roof plies.

The retrofit collar 338 and skirt 340 of retrofit waterproofing assembly 270 is opened on its seam 342 and fit around the support post (104). With the assembly in place, the slip joint 344 on the collar 338 and skirt 340 is slid or snapped into place. The watertight flap 360 will be positioned facing downward, as shown in FIG. 17. A stainless steel hose clamp (132) is then positioned on the collar and clamped tight.

The support post construction (100) of this invention using either waterproofing assembly 124 or retrofit waterproofing assembly 270 can be used to support generally any rooftop construction as is done today. An example is to support fencing or an equipment screen, as shown in FIGS. 12 and 13 generally at 380. Roof mounted equipment fences or screens are often used at the perimeters of buildings to hide roof mounted machinery from ground view. The design as shown uses four front upright posts 384, 386, 388, 390 and four angled constructions 392 of this invention. The four front upright posts 384, 386, 388, 390 are mounted about sixteen inches apart as shown by dimension 400. The angled (angle iron brace) constructions 392 are at a forty-five degree angle and are welded at their tops to the upright constructions. They have a forty-five degree lead jack 404 and use the same waterproofing assemblies 128 or 270 as discussed above.

The collar portion of the waterproofing assembly can be formed as a separate unit from the skirt portion as shown in FIGS. 18-21 by waterproofing assembly 420. This can be for the standard or for the open-seam wrap around embodiments. This has the advantage that a single skirt portion 424 can be used for all types and shapes of support posts (104), and it is only the collar portion 428 with its different shapes of openings 432 (see FIGS. 8a, 8b and 8c) which varies. The separate collar 428 then acts like a plug to fit into the opening 436 at the top of the skirt 424 when pulled open as shown in FIG. 21. The collar 428 has a parting line 438 which opens to allow for installation. The slip joint 440 and watertight flap 442 are illustrated in the enlarged view of FIG. 22. Preferred dimensions 444, 446, 448, 450 are 0.51, 0.06, R1.38 and R1.48 inches, respectively. The (stainless steel) hose clamp (132) compresses and secures the plug 428 in place relative to the skirt 424 and the post (104). If needed, two clamps can be used, one above the other, as shown in FIG. 23 by hose clamps 452, 454. The two clamp embodiment will likely require a longer or taller collar (plug) 460 as depicted in FIG. 25.

The rim or flange 464 on the plug 460 allows for a positive stopping point when installing it into the construction. Also, it is a good waterproofing technique to let water that is flowing off the top of the plug 460 pass over the seam 470 of the collar and not into the seam. The flange 464 will overlap to the outside of the base of the collar.

FIGS. 28 and 29 show generally at 500 an alternative retrofit waterproofing assembly of this invention. It includes a slip joint 504 on the collar 508 and skirt 512. FIG. 30 is an enlarged view of the upper right portion of FIG. 29 showing in greater detail the slip joint 504 which allows the collar 508 to open.

Referring now to FIG. 31, an assembled EPDM rubber snap joint with flap is illustrated generally at 520 with the male insert 524 snapped with snap 528 into the female adapter 532. It functions generally similar to a ZIP LOCK bag. Unlike a typical plastic ZIP LOCK bag, the present assembly is made of rubber and its cross-section is different. Also, the snap and adapter areas are preferably made using a harder rubber than the rubber in the base collar. The collar is manufactured laying flat and then turned around to the point that the snap joint 520 can be pushed in by finger pressure. This is the only known roofing product that locks in place without tools.

Thus, the waterproof roof deck post constructions of this invention do not deform or shrink and thus prevent water from flowing into the roof penetration. Unlike the asphalt of the prior art Pitch Pocket, the waterproofing assembly will not crack over time requiring maintenance. The present constructions are also considerably cheaper and more attractive than the Pitch Pocket design. Additionally, the constructions of this invention are easier and quicker to install.

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof.

What is claimed is:

1. A waterproof roof deck post construction, comprising:

a deck post having a post cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the post;

a flange secured to a lower end of the sleeve and extending out therefrom, the flange being secured relative to the roof deck;

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the post cross-section, the post being disposed in the opening, the collar surrounding the post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve; and

a band surrounding the collar and securing in a generally watertight manner the collar to the post; and

the collar being formed as a plug which is a separate piece from the skirt and is adapted to be fitted into an opening in the skirt, and the plug having a seam that allows the plug to open and wrap around the deck post.

2. The construction of claim 1 wherein the post cross-section is non-circular.

3. The construction of claim 1 wherein the skirt is generally frusto-conical in shape, a lowermost perimeter edge of the skirt is spaced a distance above a top surface of the roof deck thereby exposing a portion of the sleeve between the edge of the skirt and the top surface of the roof deck.

4. A waterproofing assembly, comprising:

a collar;

a skirt;

the skirt and collar including a split joint allowing the collar and skirt to be opened up, wrapped around an elongate member, and closed in a watertight manner with the collar generally above the skirt and secured thereto; and

the collar being formed as a plug which is a separate piece from the skirt and is adapted to be fitted into an opening in the skirt, and the plug having a seam that allows the plug to open and wrap around the elongate member.

5. A waterproof roof deck post construction, comprising:

a deck post having a post cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the post;

a flange secured to a lower end of the sleeve and extending out therefrom, the flange being secured relative to the roof deck;

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the post cross-section, the post being disposed in the opening, the collar surrounding the post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

a band surrounding the collar and securing in a generally watertight manner the collar to the post; and

a split joint on the collar and the skirt, the split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly;

wherein the post cross-section is non-circular.

6. The construction of claim 5 wherein the non-circular cross-section of the opening is a polygonal shape.

7. The construction of claim 5 wherein the non-circular shape is an L shape.

8. A waterproof roof deck post construction, comprising:

a deck post having a post cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the post;

a flange secured to a lower end of the sleeve and extending out therefrom, the flange being secured relative to the roof deck;

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the post cross-section, the post being disposed in the opening, the collar surrounding the post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

a band surrounding the collar and securing in a generally watertight manner the collar to the post; and

a split joint on the collar and the skirt, the split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly;

wherein the collar comprises an elastomeric material.

9. A waterproof roof deck post construction, comprising:

a deck post having a post cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the post;

a flange secured to a lower end of the sleeve and extending out therefrom, the flange being secured relative to the roof deck;

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the post cross-section, the post being disposed in the opening, the collar surrounding the post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

a band surrounding the collar and securing in a generally watertight manner the collar to the post; and

a split joint on the collar and the skirt, the split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly;

wherein the waterproofing assembly includes a top rim extending about a circumferential top outer edge of the collar.

10. The construction of claim 9 wherein the waterproofing assembly includes a circumferential shoulder interconnecting the collar and the skirt.

11. The construction of claim 10 wherein the waterproofing assembly is an EPDM molded rubber construction.

12. A waterproof roof deck post construction, comprising:

a deck post having a post cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the post;

a flange secured to a lower end of the sleeve and extending out therefrom, the flange being secured relative to the roof deck;

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the post cross-section, the post being disposed in the opening, the collar surrounding the post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

a band surrounding the collar and securing in a generally watertight manner the collar to the post; and

a split joint on the collar and the skirt, the split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly;

wherein the collar is formed as a plug which is a separate piece from the skirt and is adapted to be fitted into an opening in the skirt.

13. A waterproof roof deck post construction, comprising:

a deck post secured to a roof deck;

a sleeve assembly wrapped around the post and having a seam thereof sealed closed, the sleeve assembly including a lower flange which is secured to the roof deck;

a waterproofing assembly including a collar and a skirt, and a split joint through the skirt and collar;

the collar surrounding the post above a top of the sleeve assembly, the skirt extending down from the collar and out over the top of the sleeve assembly, and the split joint is closed in a watertight manner;

a split joint including a female adapter and a male component which is snapped in place into the female

adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly; and

a band surrounding the collar and securing in a generally watertight manner the collar to the post;

wherein the post cross-section is non-circular; and

wherein the waterproofing assembly has a post receiving opening having a non-circular cross-section, corresponding to the non-circular cross-section of the deck post.

14. The construction of claim 13 wherein the non-circular cross-section of the opening is a polygonal shape.

15. A waterproof roof deck post construction, comprising:

a deck post secured to a roof deck;

a sleeve assembly wrapped around the post and having a seam thereof sealed closed, the sleeve assembly including a lower flange which is secured to the roof deck;

a waterproofing assembly including a collar and a skirt, and a split joint through the skirt and collar;

the collar surrounding the post above a top of the sleeve assembly, the skirt extending down from the collar and out over the top of the sleeve assembly, and the split joint is closed in a watertight manner;

a split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly; and

a band surrounding the collar and securing in a generally watertight manner the collar to the post;

wherein the collar comprises a plug formed as a separate piece from the skirt and adapted to fit into an opening in the skirt.

16. A waterproof roof deck post construction, comprising:

a deck post secured to a roof deck;

a sleeve assembly wrapped around the post and having a seam thereof sealed closed, the sleeve assembly including a lower flange which is secured to the roof deck;

a waterproofing assembly including a collar and a skirt, and a split joint through the skirt and collar;

the collar surrounding the post above a top of the sleeve assembly, the skirt extending down from the collar and out over the top of the sleeve assembly, and the split joint is closed in a watertight manner;

a split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly; and

a band surrounding the collar and securing in a generally watertight manner the collar to the post;

wherein the sleeve assembly includes a watertight flap which secures the split joint closed.

17. A waterproofing assembly, comprising:

a collar;

a skirt;

the skirt and collar including a split joint allowing the collar and skirt to be opened up, wrapped around an elongate member, and closed in a watertight manner with the collar generally above the skirt and secured thereto; and

the split joint including a female adapter and a male component which is snapped in place into the female adapter to secure the waterproofing assembly, the male component being detachable from the female adapter for retrofitting the waterproofing assembly;

wherein the collar and skirt are formed as two separate pieces with the collar defining a plug which fits into an opening of the skirt.

18. The assembly of claim 17 wherein the plug has a through-opening with a non-circular cross-section.

19. The assembly of claim 18 wherein the non-circular cross-section is an L shape, a rectangular shape, a polygonal shape, a T shape or a U shape.

20. A method of constructing a waterproof roof deck post construction, comprising:

(a) securing a deck post having a post cross-section to a roof deck;

(b) securing a sleeve positioned over and surrounding the post to a roof deck;

(c) providing a waterproofing assembly including a collar and a skirt, the collar having an opening which has generally the same cross-section as that of the post cross-section;

(d) positioning the waterproofing assembly such that the deck post extends through the collar opening and the skirt extends down over a top of a pipe jack;

(e) snapping a male component into a female adapter to position the waterproofing assembly relative to the deck post; and

(f) after (d), applying a band around the collar to secure the collar in a generally watertight manner to the post;

wherein the collar has an opening with a non-circular cross-sectional shape which corresponds to a cross-sectional shape of the post.

21. A method of constructing a waterproof roof deck post construction, comprising:

(a) securing a deck post having a post cross-section to a roof deck;

(b) securing a sleeve positioned over and surrounding the post to a roof deck;

(c) providing a waterproofing assembly including a collar and a skirt, the collar having an opening which has generally the same cross-section as that of the post cross-section;

(d) positioning the waterproofing assembly such that the deck post extends through the collar opening and the skirt extends down over it top of a pipe jack;

(e) snapping a male component into a female adapter to position the waterproofing assembly relative to the deck post; and

(f) after (d), applying a band around the collar to secure the collar in a generally watertight manner to the post;

wherein the collar comprises a plug which is a separate piece from the skirt, and further comprising inserting the plug into an opening in the skirt.

* * * * *

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(12) **United States Patent**
Evensen et al.

(10) **Patent No.: US 6,640,503 B1**
(45) **Date of Patent: Nov. 4, 2003**

(54) **WATERPROOF ROOF DECK POST CONSTRUCTION AND METHOD**

(75) Inventors: **Lawrence P. Evensen**, 29254 Greenwater Rd., Malibu, CA (US) 90265; **Mark Andersen**, Woodland Hills, CA (US); **Richard Spindel**, Granada Hills, CA (US)

(73) Assignee: **Lawrence P. Evensen**, Westlake Village, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 219 days.

(21) Appl. No.: **09/628,598**

(22) Filed: **Jul. 28, 2000**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/240,807, filed on Feb. 1, 1999.

(51) **Int. Cl.**[7] **E04D 3/38**

(52) **U.S. Cl.** **52/60**; 52/58; 52/199; 52/741.4; 277/602; 277/607; 277/625; 277/644; 285/42

(58) **Field of Search** 52/199, 58, 59, 52/60, 219, 741.4; 285/83, 82, 42; 277/212, 602, 607, 625, 626, 644

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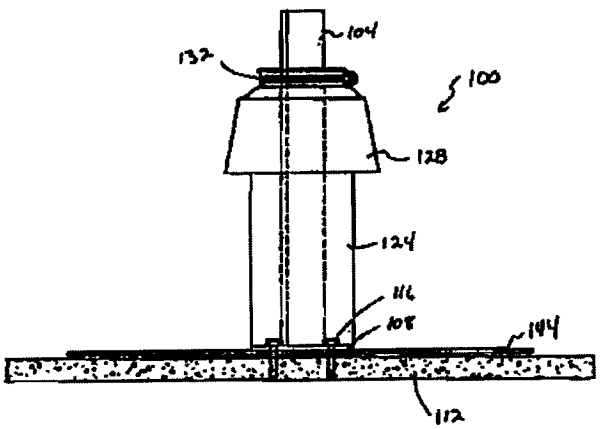
Primary Examiner—Carl D. Friedman
Assistant Examiner—Jennifer I. Thissell
(74) *Attorney, Agent, or Firm*—Oppenheimer Wolff & Donnelly LLP

(57) **ABSTRACT**

A deck post (or brace) having a non-circular cross-section is secured to a roof deck. A lead pipe jack (sleeve) is slid over the post. A waterproofing assembly having a collar and a skirt is provided; the collar has an opening with generally the same non-circular cross-section as that of the post. The collar opening is positioned on the deck post, and the unit is slid down the post until the collar is at the top of the sleeve, the skirt extending down over the sleeve. A clamp is then positioned and tightened around the collar to provide a watertight seal on the deck post. When the post is already installed on a roof deck and the sleeve and the waterproofing assembly cannot be slid into place on the post, a modified retrofit waterproofing assembly and sleeve are used to provide the waterproofing. The modified sleeve is a split lead flashing jack with an open seam on one side. The sleeve is opened up, wrapped around the post and soldered closed. The modified waterproofing assembly has a split joint through the skirt and collar. To position this assembly on the post at the top of the split lead flashing jack, the joint is opened up, the assembly wrapped around the post and the slip joint closed with a watertight flap. A locking closure can be provided having a locking clasp and a locking slot. Another alternative waterproofing assembly forms the collar as a plug separate from the skirt; the skirt is opened and the plug inserted therein. This arrangement allows a plug having the desired opening configuration to be selected from an inventory of different plugs and used with a single skirt design. Another alternative of the waterproofing assembly provides a series of flanged tabs on the top edge of the collar for connecting to the collar plug. The flanged tabs may each have a projection on them which increases the pull-out resistance between a connected skirt and collar. The collar plug may also have a series of cavities which line up with the flanged tabs of the skirt. The collar plug may have a recess for the clamp. As an alternative assembly, multiple skirts can be connected together using their locking clasps and locking slots and the resulting larger skirt can then be connected to a collar.

47 Claims, 20 Drawing Sheets



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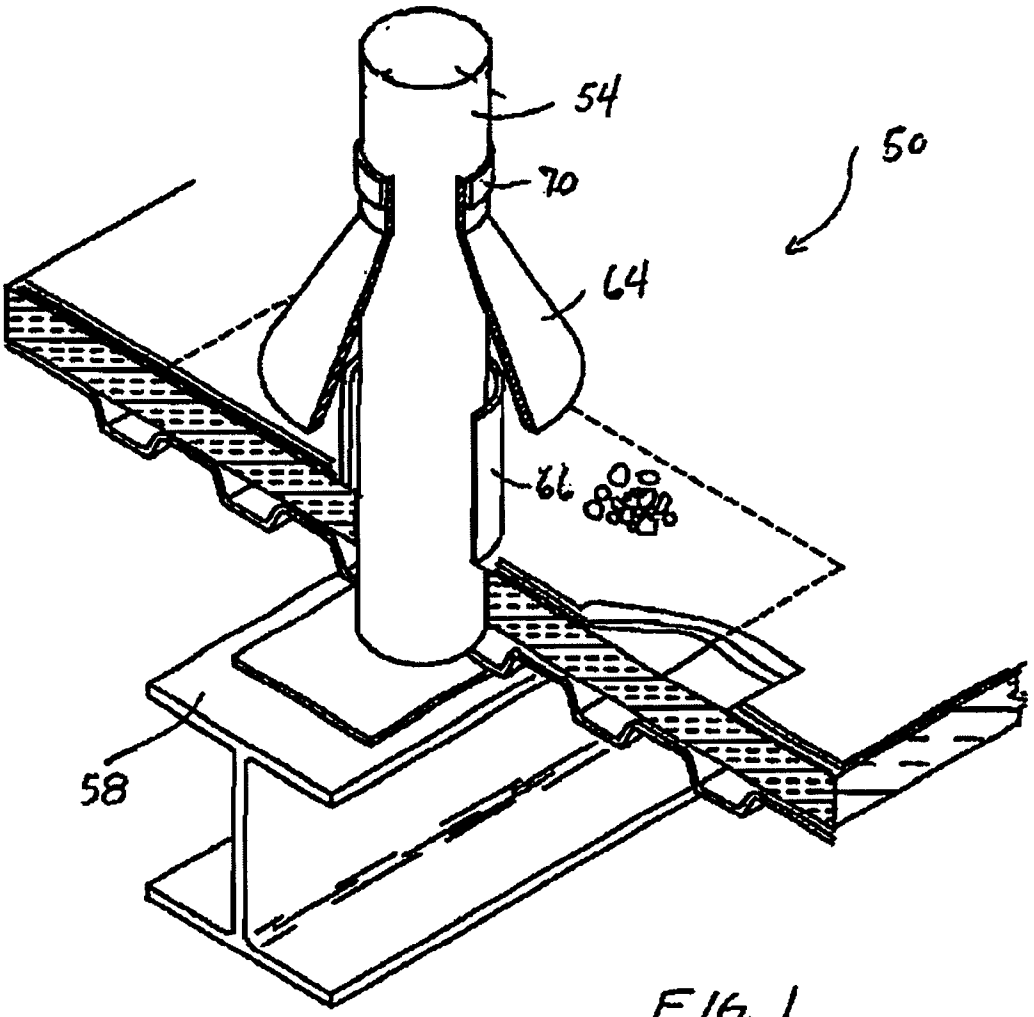


FIG. 1
(PRIOR ART)

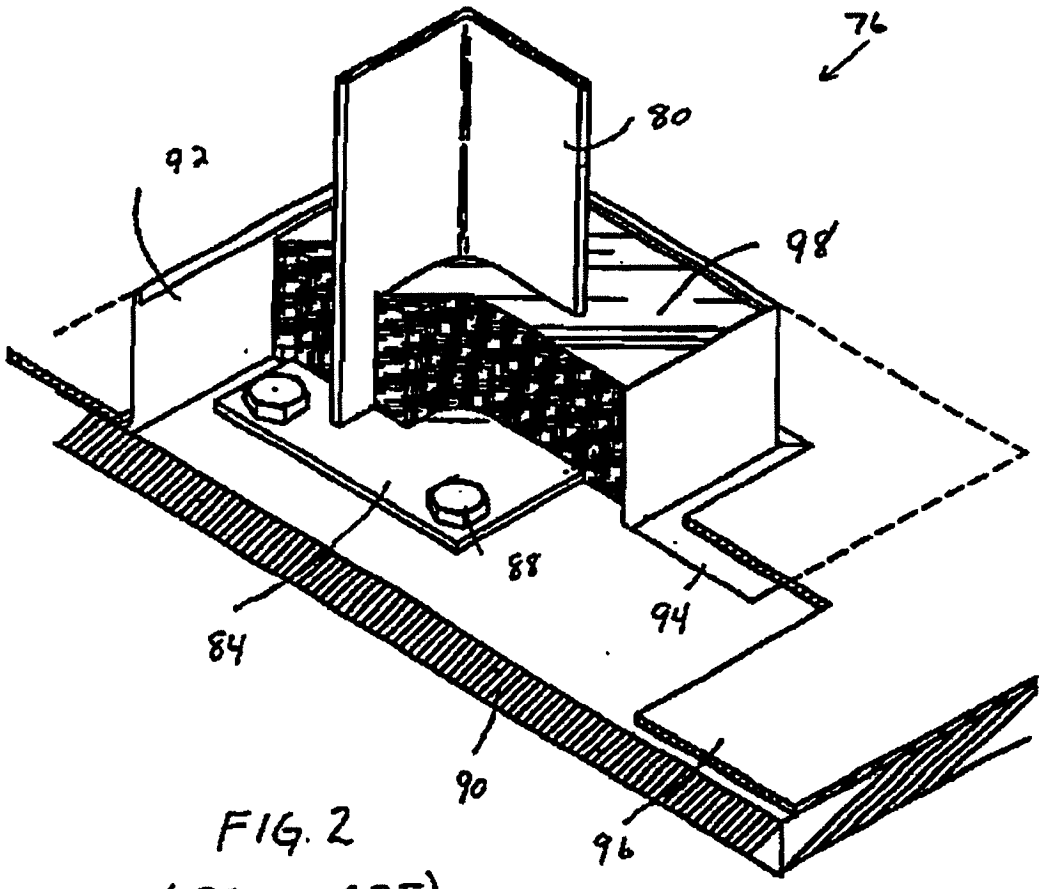


FIG. 2
(PRIOR ART)

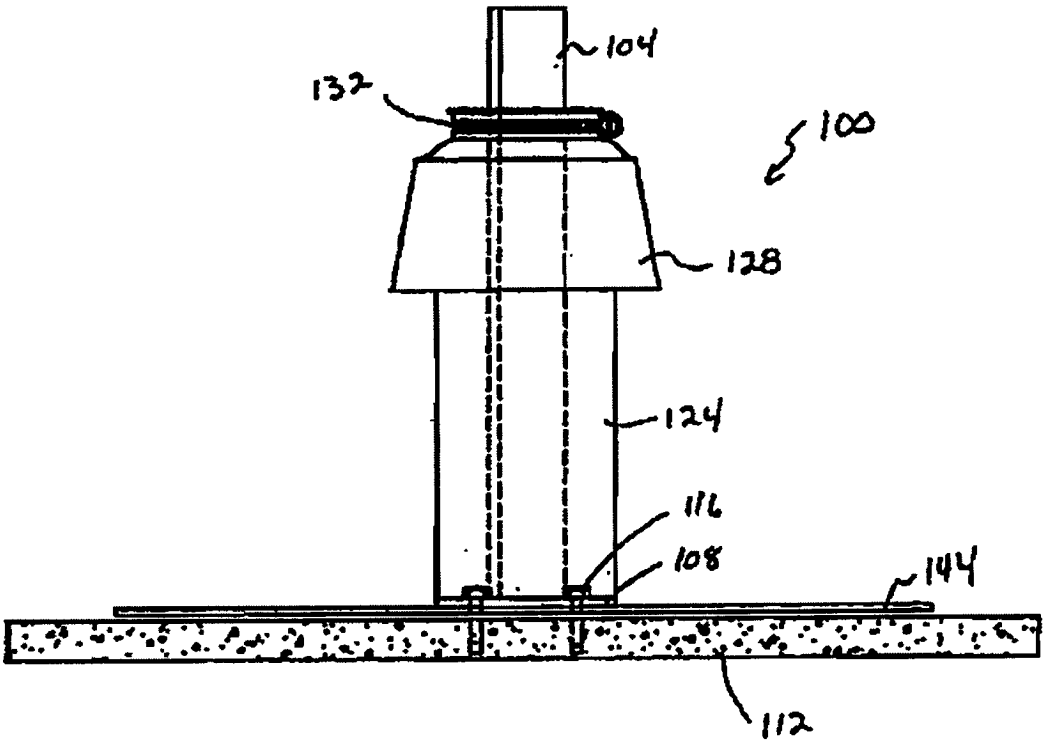


FIG. 3

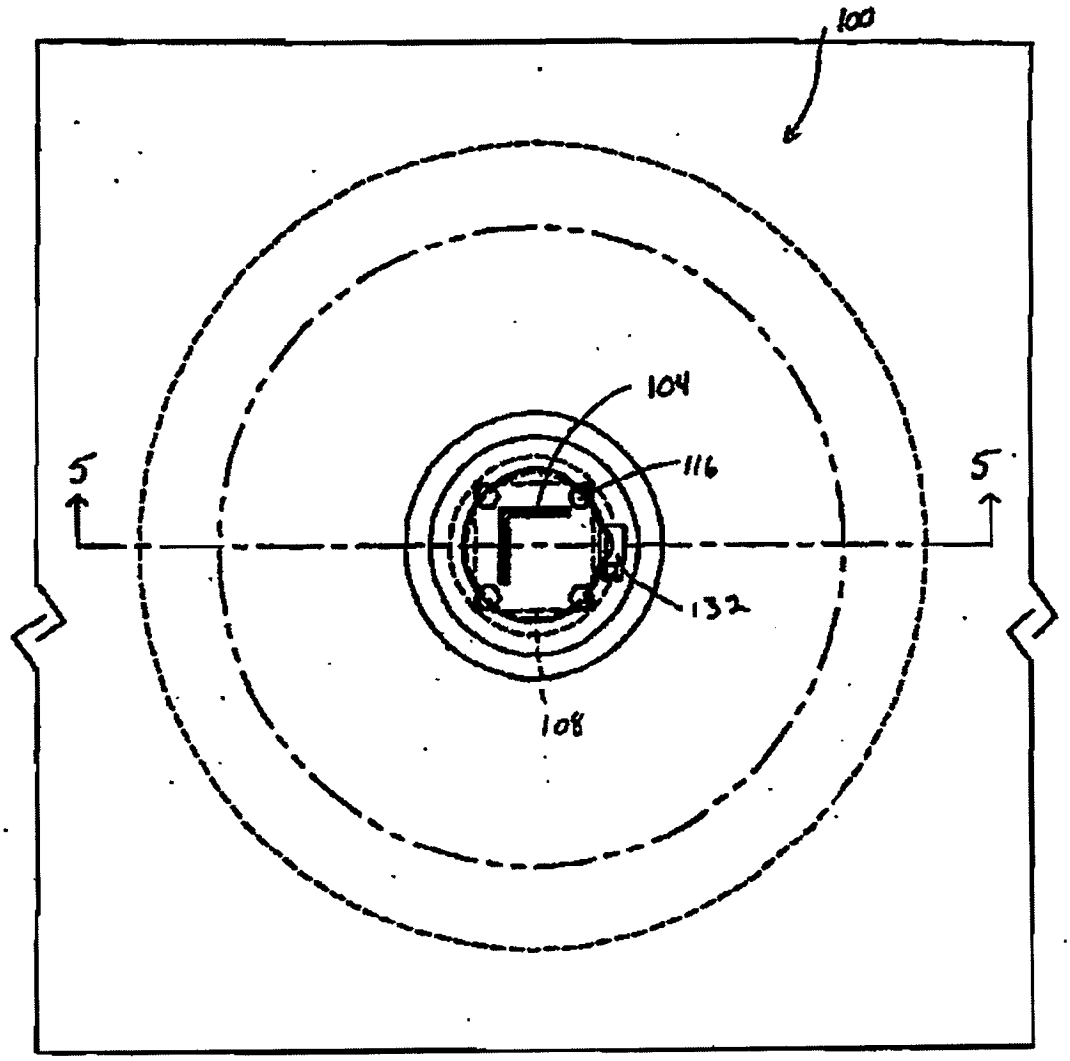
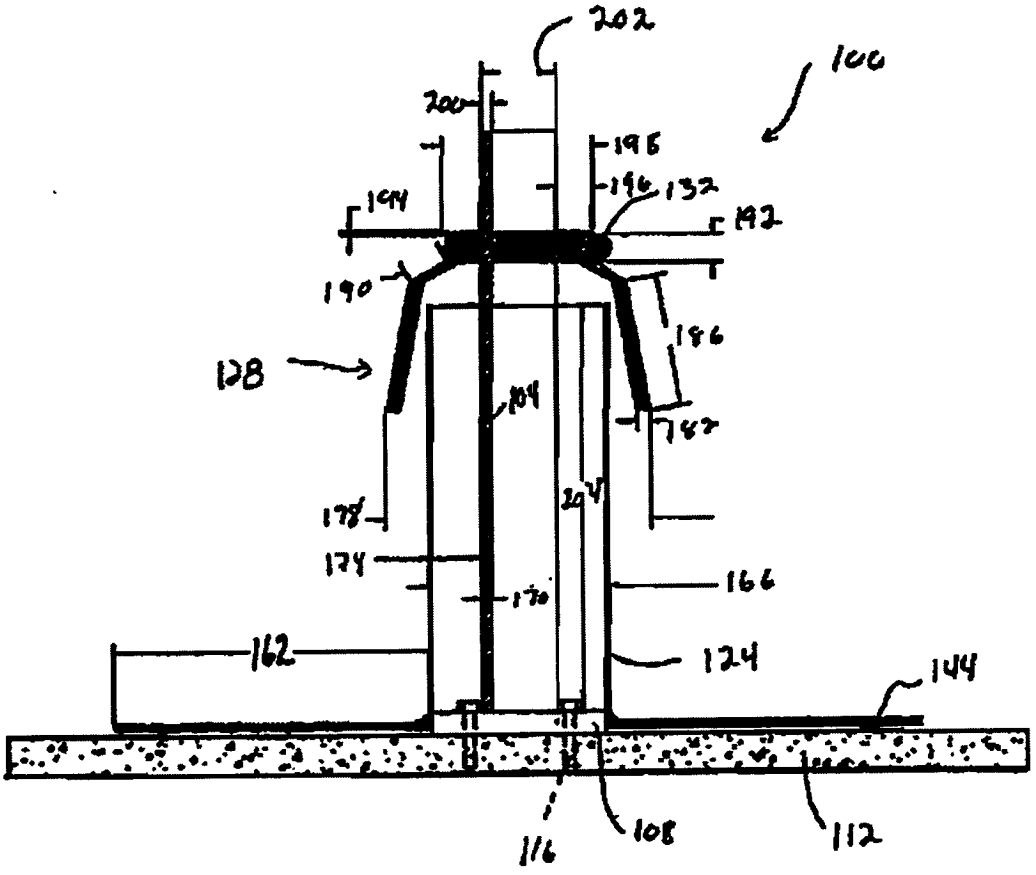


FIG 4


202
100
200
196
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132
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144
116
108
112

FIG. 5

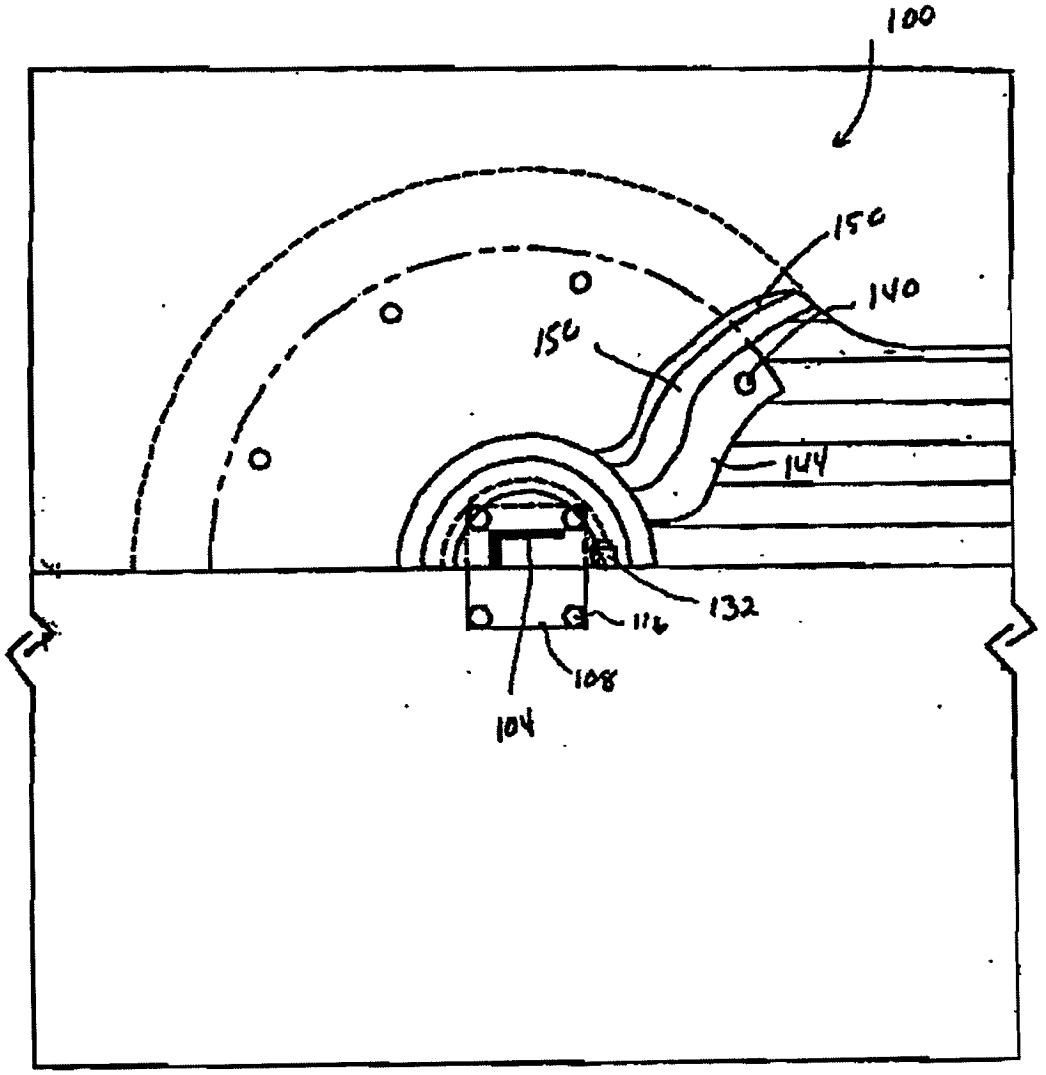


FIG. 6

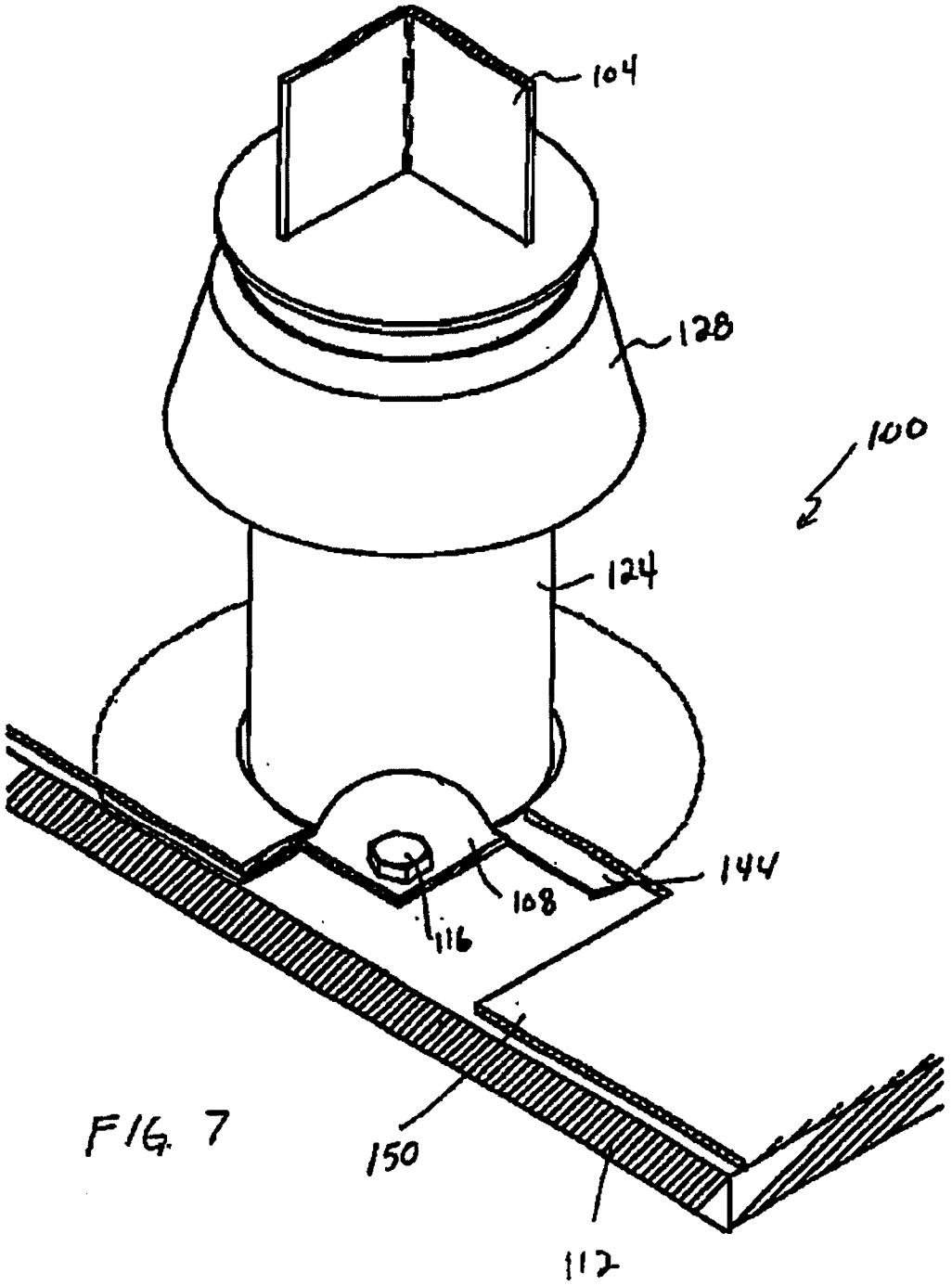


FIG. 7

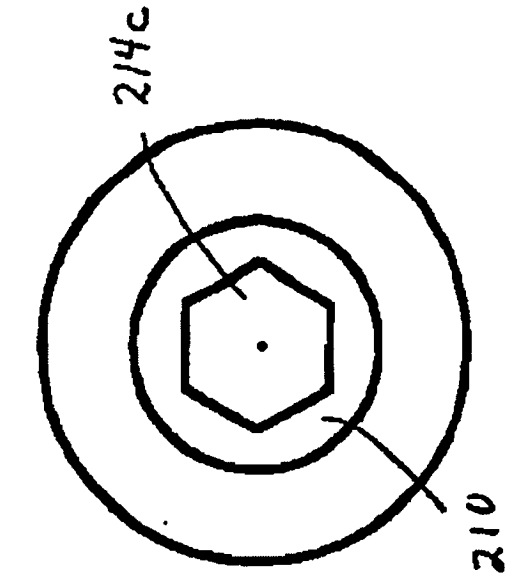


FIG. 8c

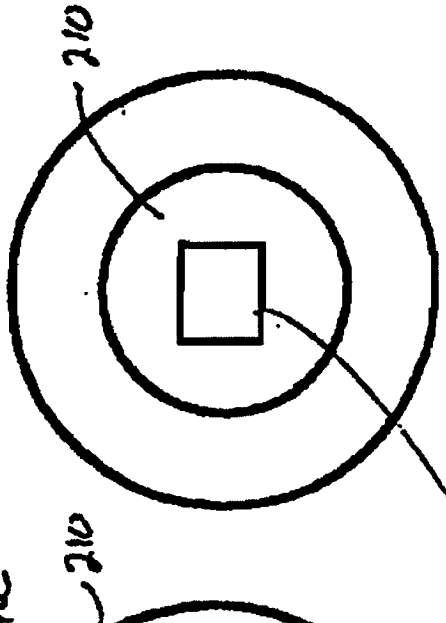


FIG. 8b

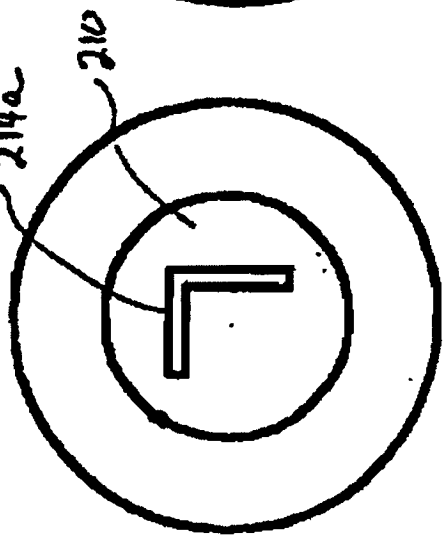
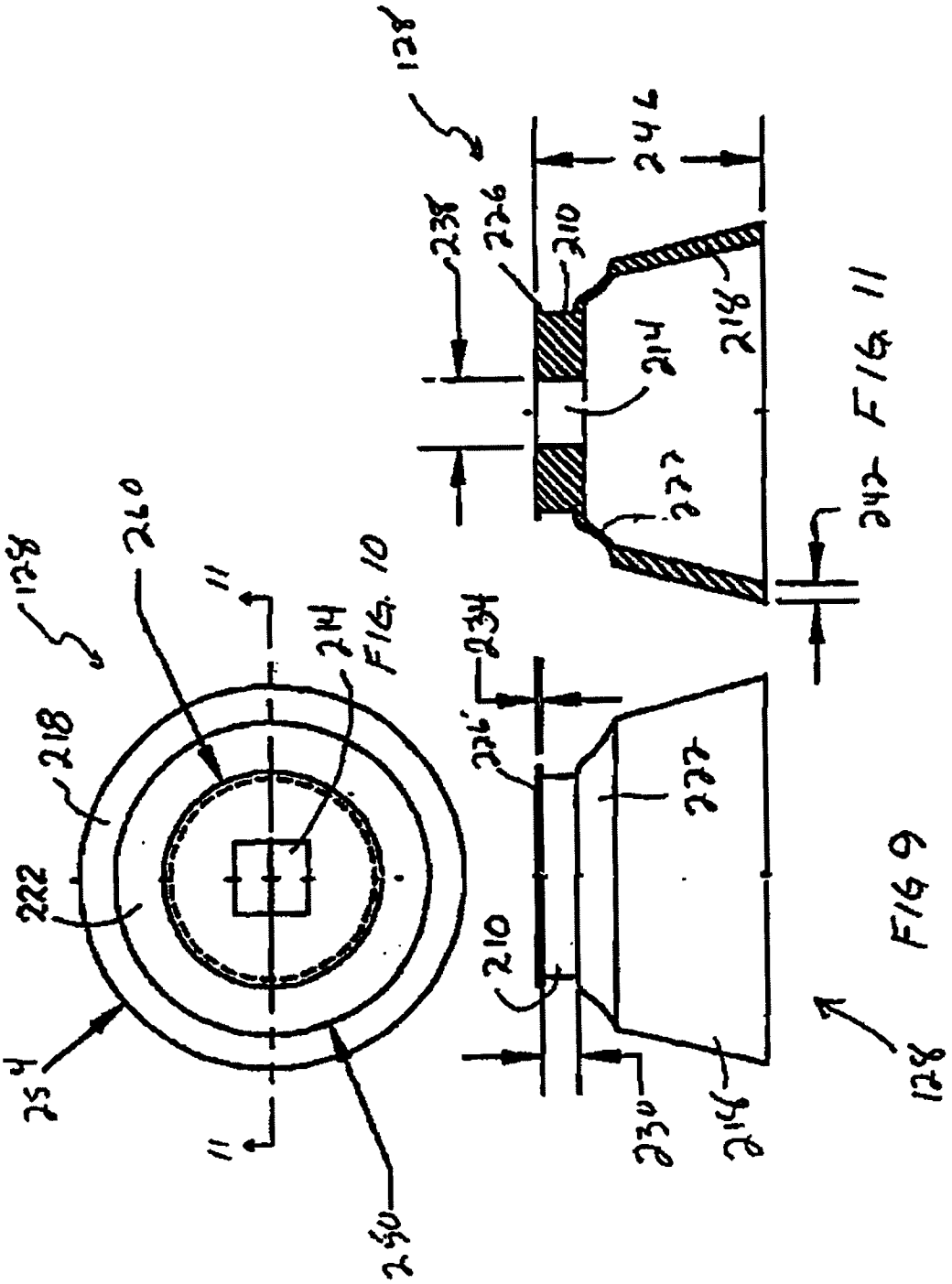


FIG. 8a


128
246
238
226
210
214
218
212
222
242
FIG. 11
128
260
11
214
FIG. 10
234
224
222
218
222
210
254
230
240
11
212
128
FIG 9

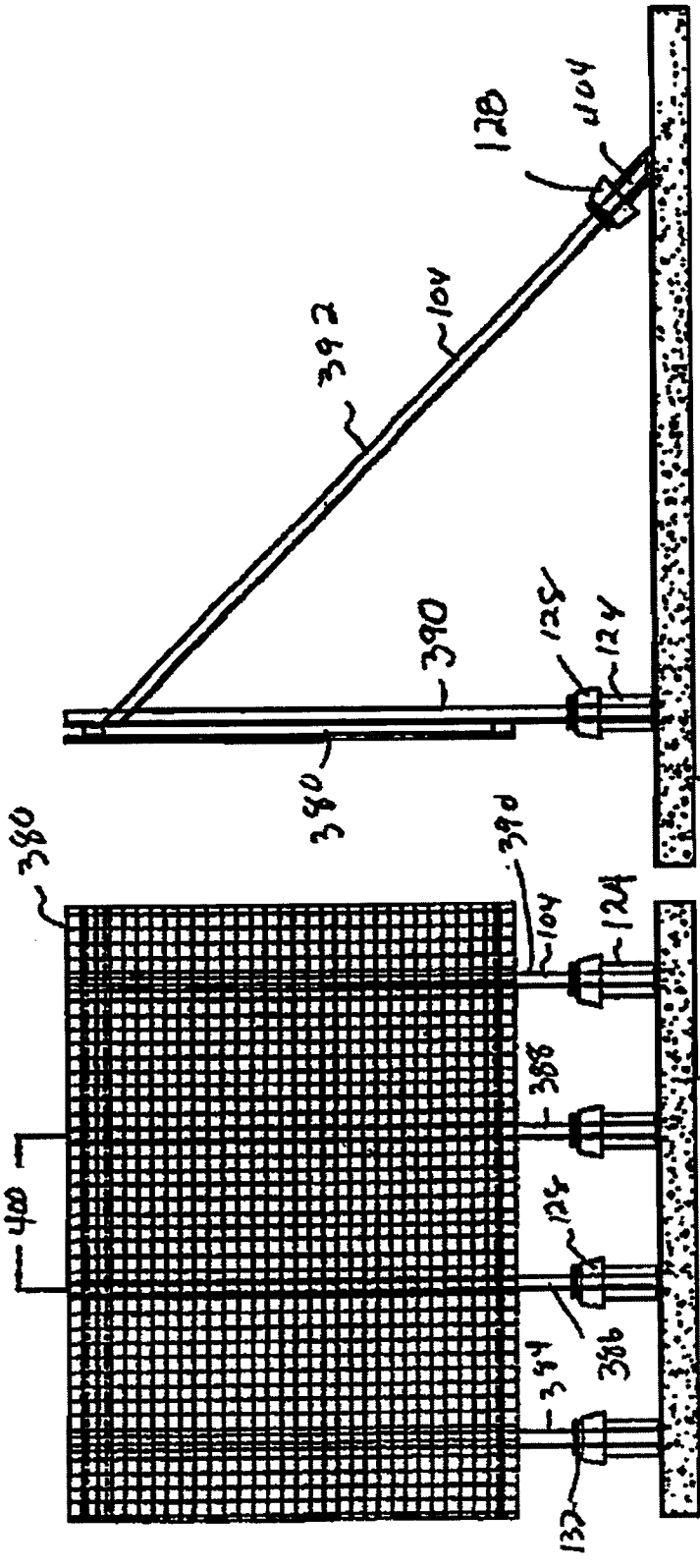

128
104
392
104
390
125
124
380
112
380
390
104
124
112
388
400
124
386
394
132

FIG 13

FIG. 12

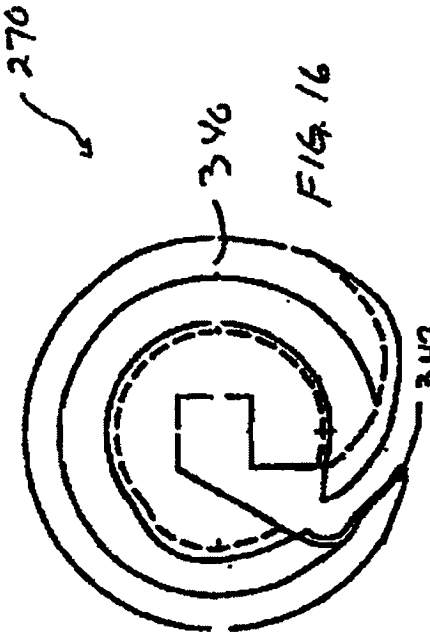


FIG. 16

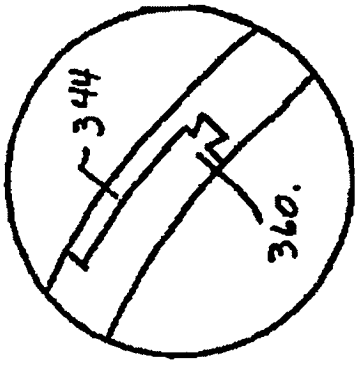


FIG. 17

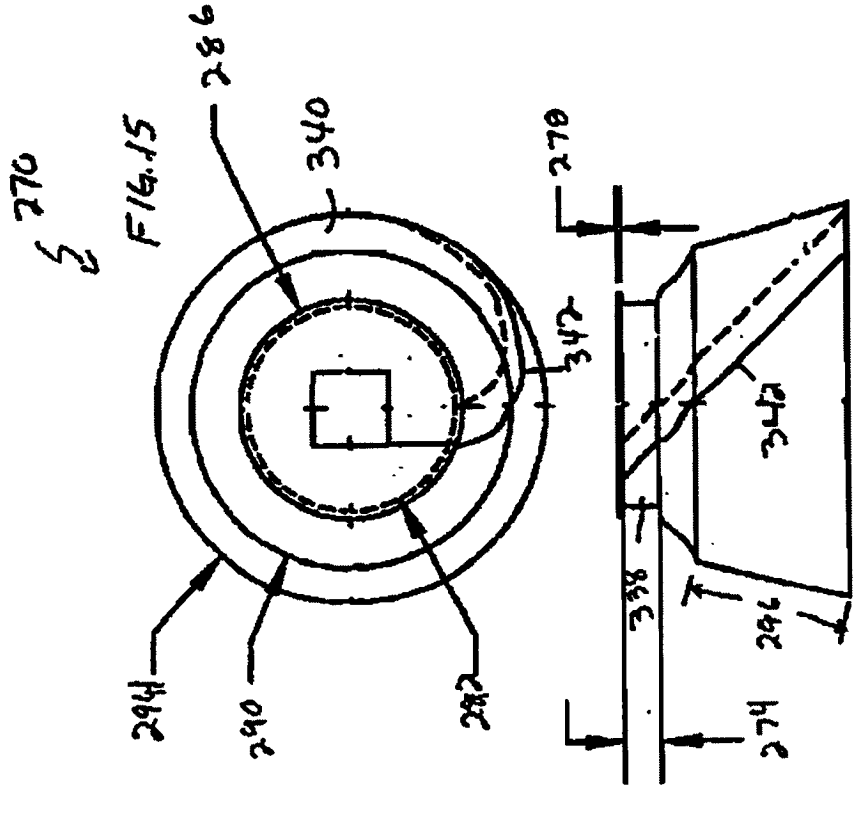


FIG. 15

FIG. 14

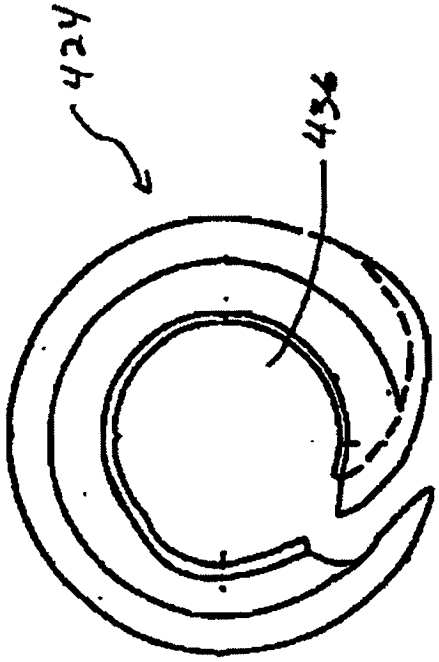


FIG. 21

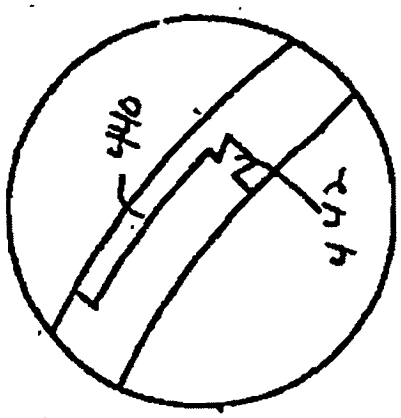


FIG. 22

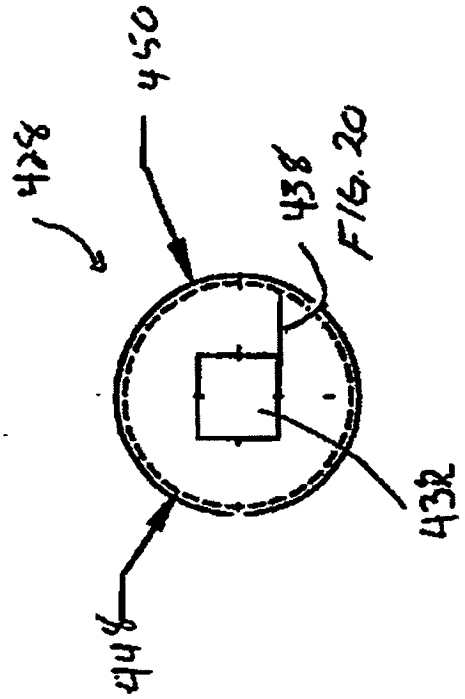


FIG. 20

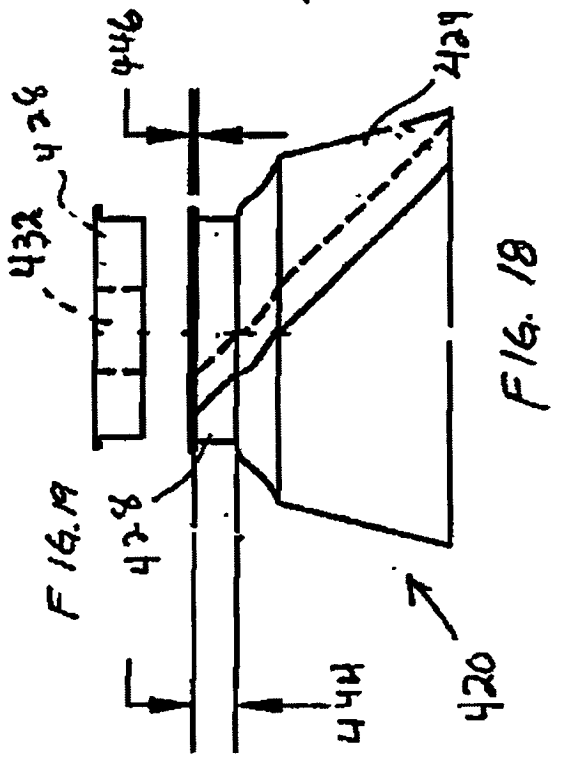


FIG. 19

FIG. 18

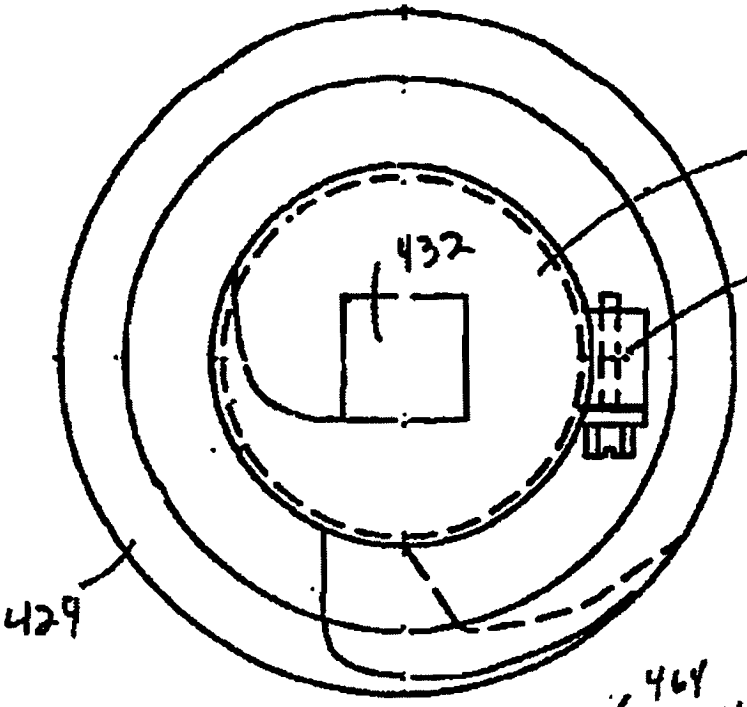


FIG. 24

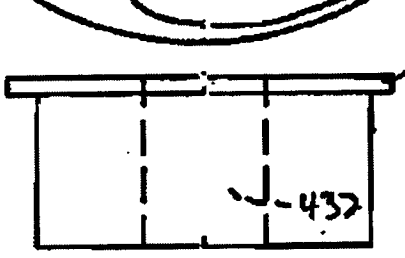


FIG. 25

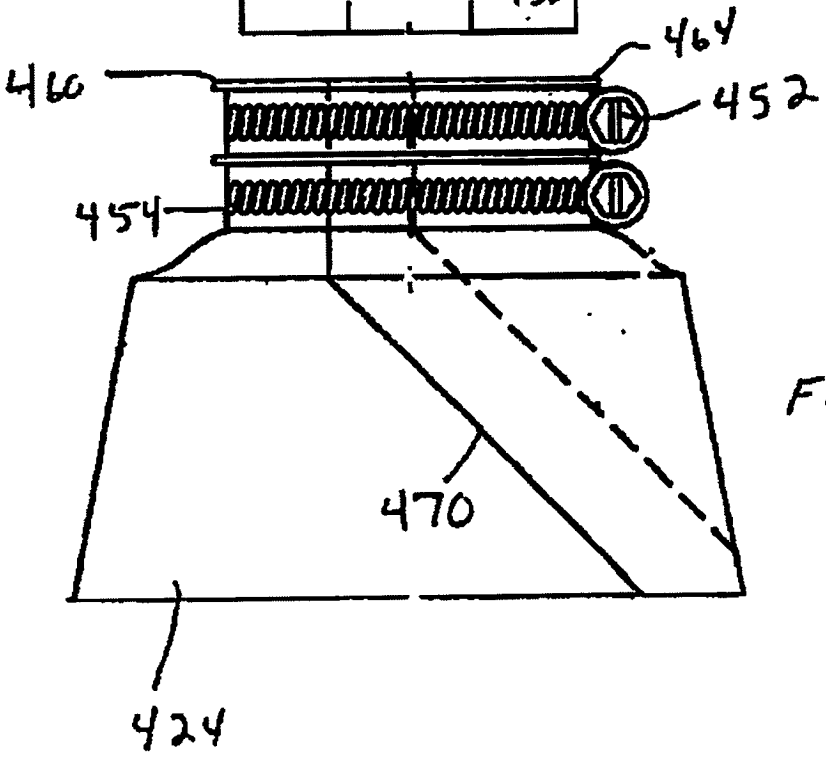


FIG. 23

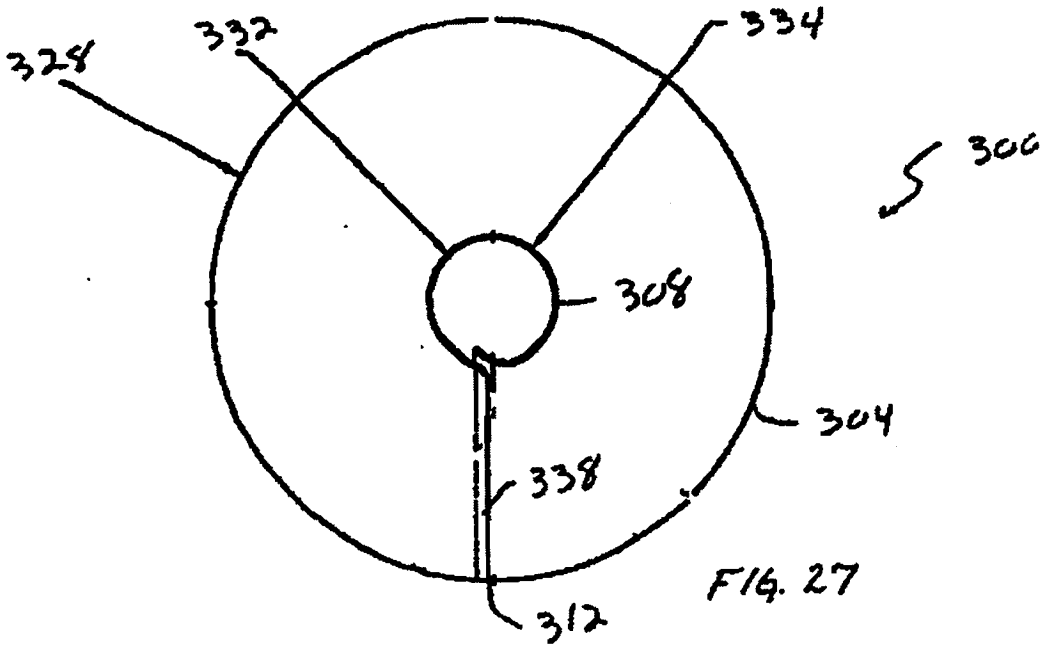


FIG. 27

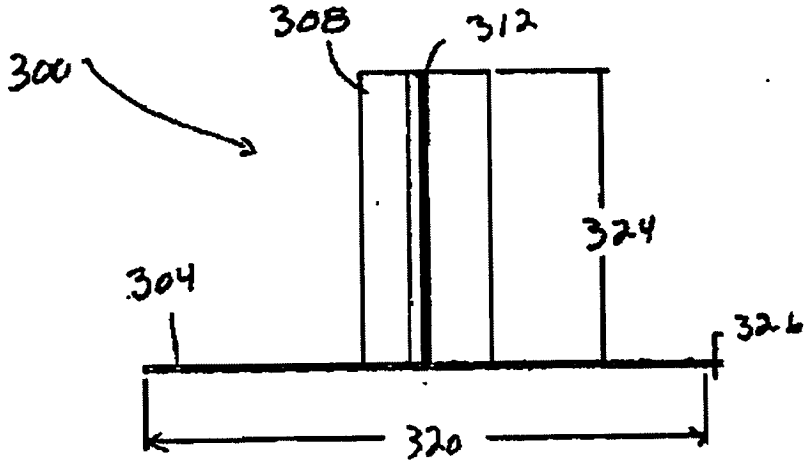


FIG 26

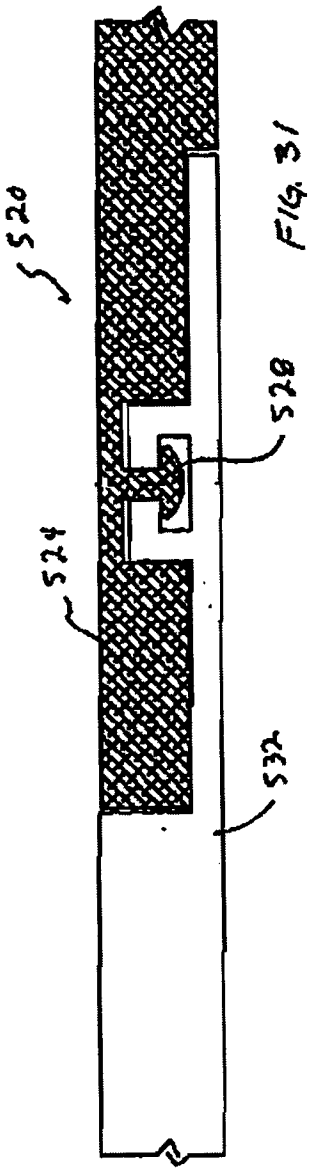


FIG. 31

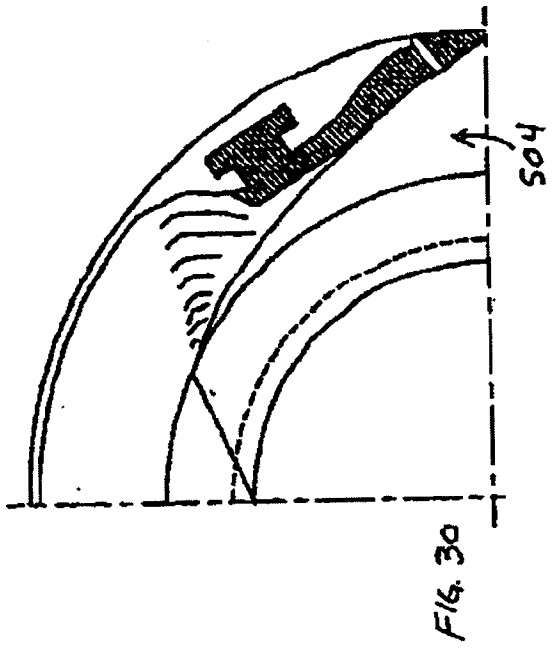


FIG. 30

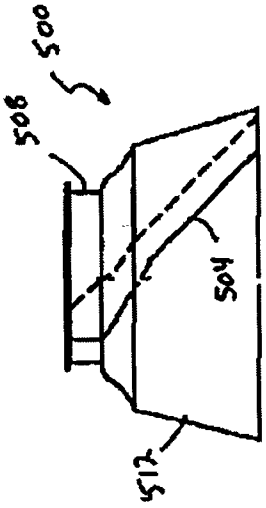


FIG. 28

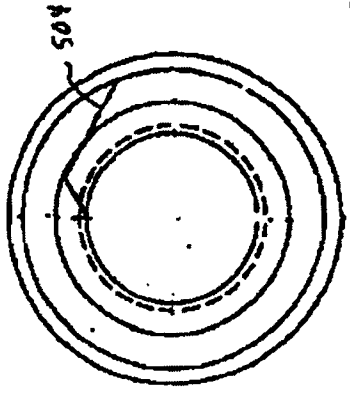


FIG. 29

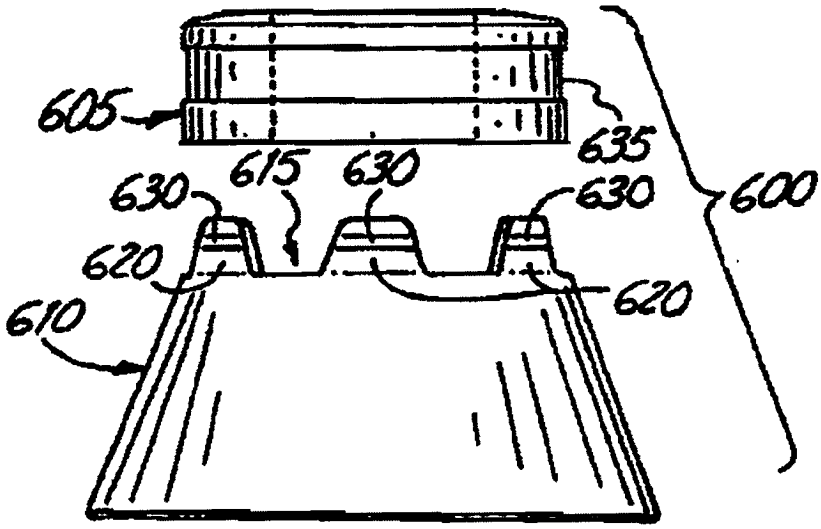


Fig. 32

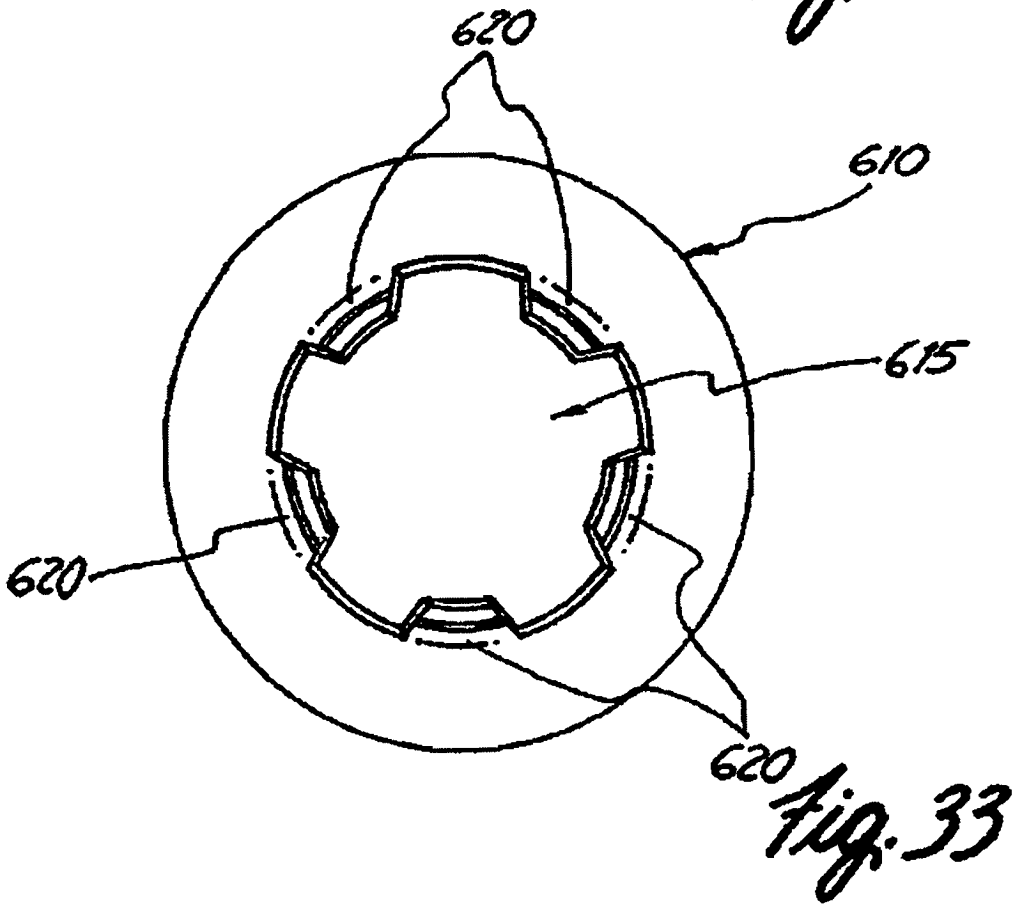


Fig. 33

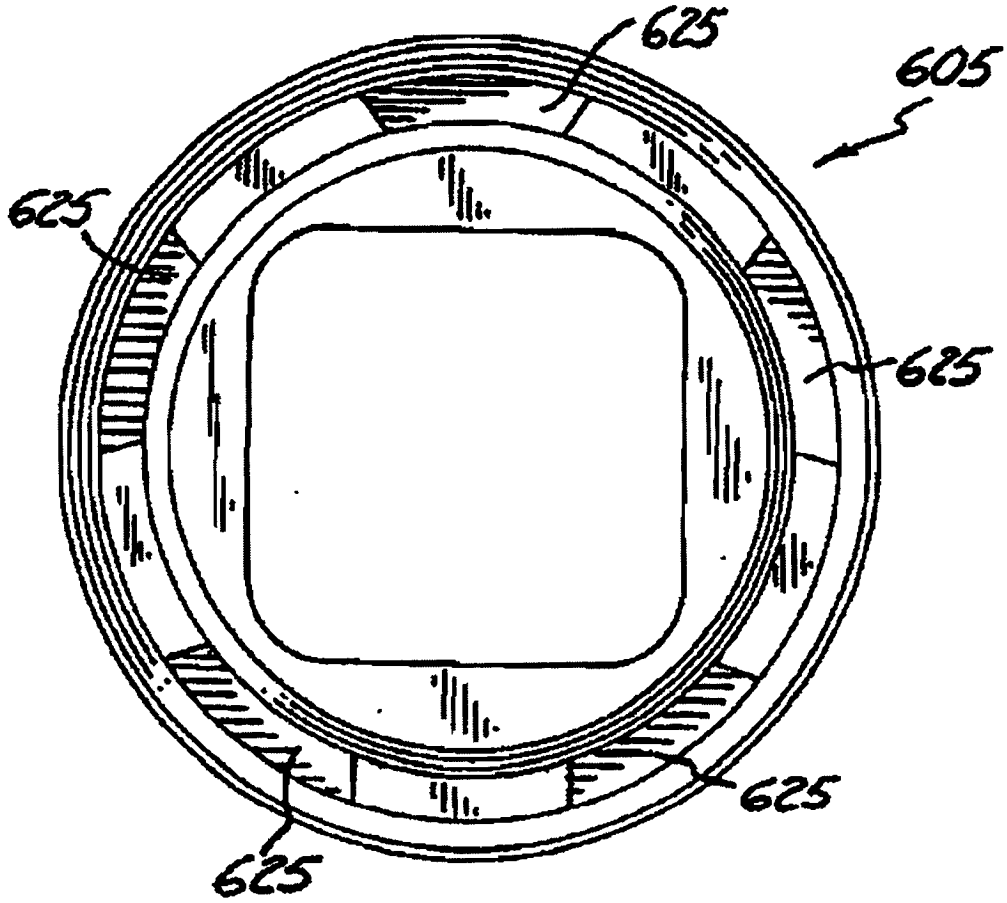


Fig. 34

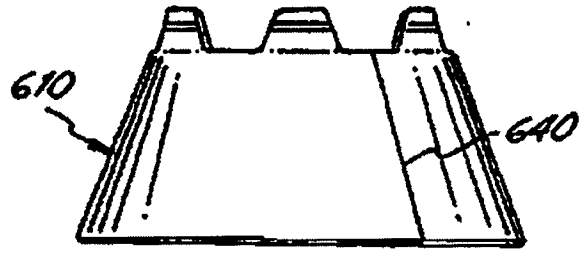


Fig. 35

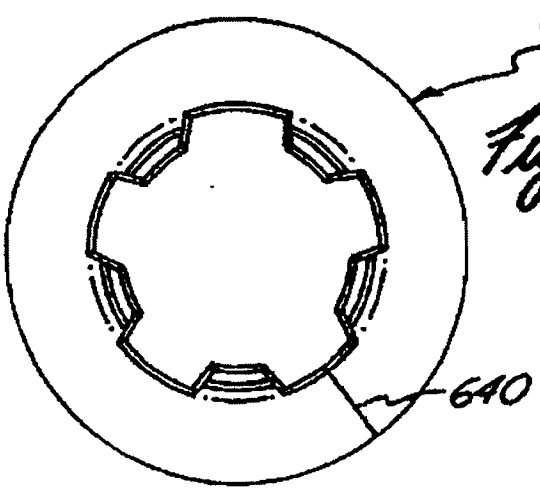


Fig. 36

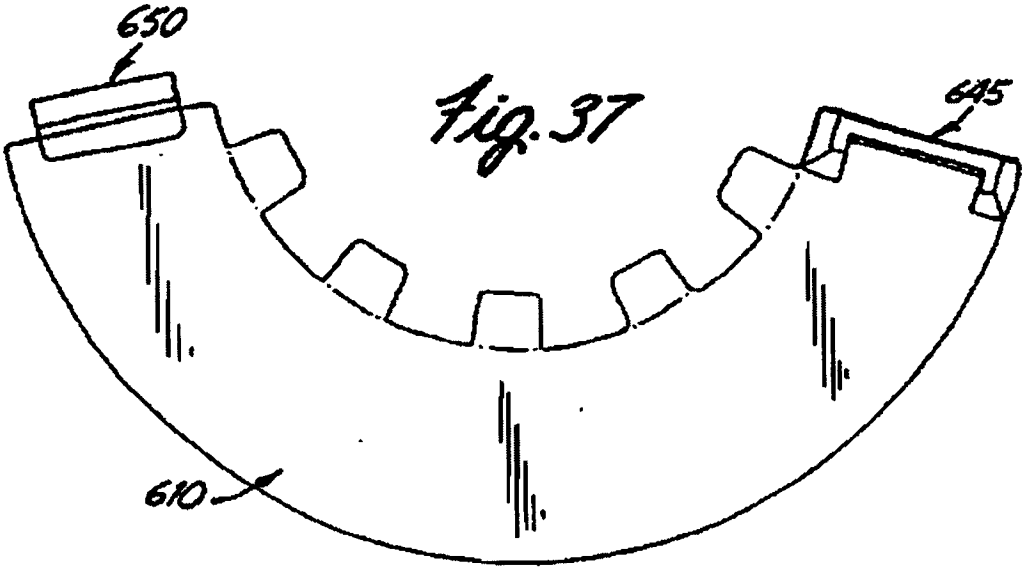


Fig. 37

Fig. 38

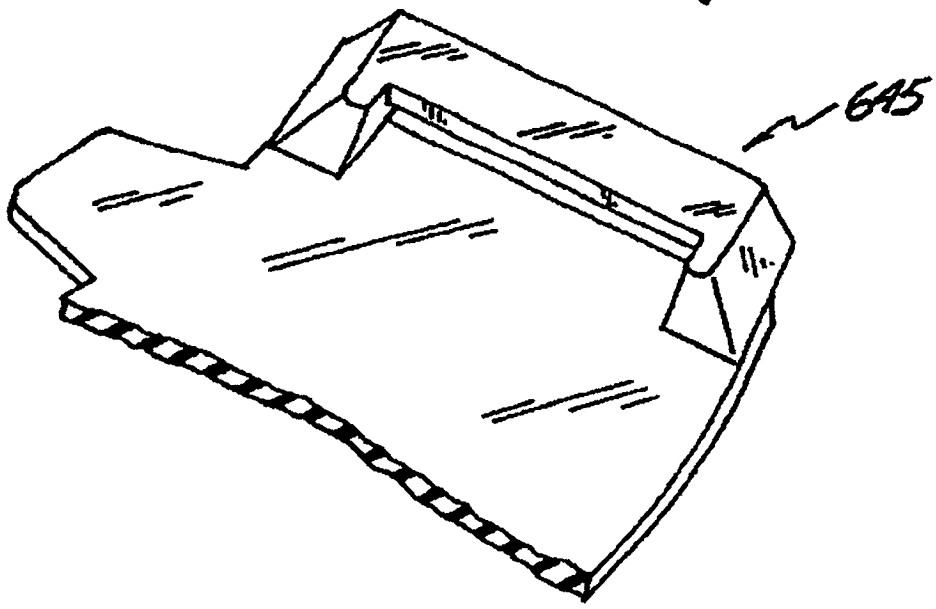


Fig. 39

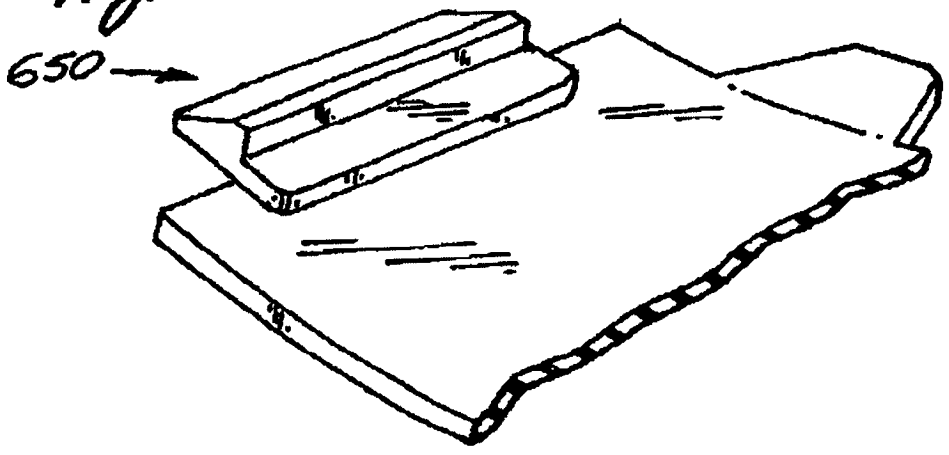
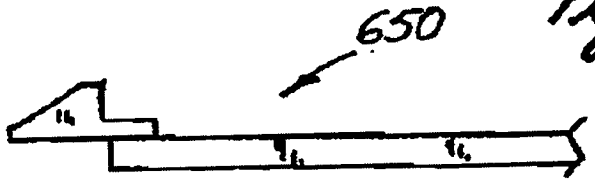


Fig. 40



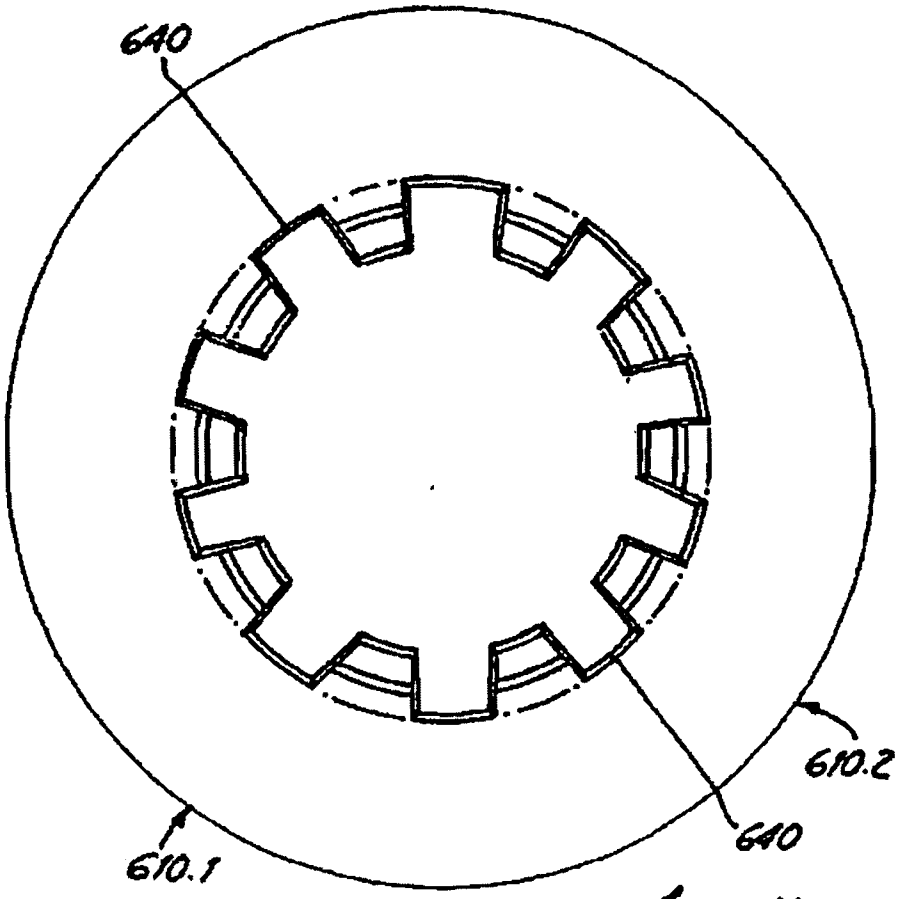


Fig. 41

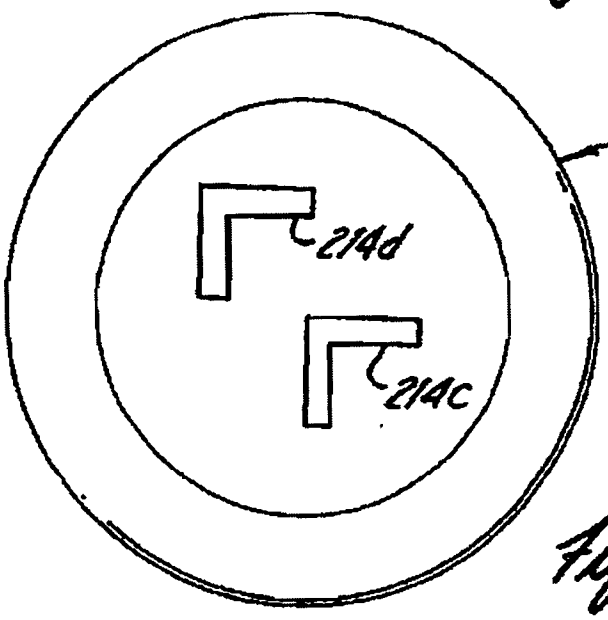


Fig. 42

WATERPROOF ROOF DECK POST CONSTRUCTION AND METHOD

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of copending application Ser. No. 09/240,807, filed Feb. 1, 1999 and whose entire contents are herein incorporated by reference.

BACKGROUND OF THE INVENTION

The present invention relates to constructions, assemblies and methods for installing and waterproofing roof deck posts, and particularly those having non-circular cross-sections.

The tops of buildings or roof decks are often used to mount various items, which typically support the use or function of the building or benefit the building's occupants in some way. These items include signs, fences, helicopter landing zones, equipment supports and even swimming pools.

When a fence, for example, is installed on top of a building, it must be installed securely so that it will not fall or blow off of the building. Additionally, the support members or posts of the fence must be attached in such a way as to maintain the water integrity of the roof. If the fence supports are bolted into the roof deck, each support will cut through or penetrate the building roof jeopardizing the water integrity of the roof unless adequate waterproofing measures are taken.

A waterproofing construction of the prior art used when the support or post is round is shown in FIG. 1 generally at 50. Referring thereto, the round post 54 is secured to structural framing 58, and is provided to support another structure such as fencing or a structural frame. An umbrella overlapping jack 64 is used to waterproof the support. The pipe jack 64 is a cone that fits snugly around the penetration and creates a waterproof seal above the roof line. FIG. 1 shows a sheet metal roof jack 66 extending at least eight inches above the roofing, and the umbrella pipe jack 64 overlaps the roof jack by a radius of three to four inches. A drawband 70 secures the upper collar portion of the pipe jack 64 to the round post 54, and caulk with sealant is applied around the top circumference. Construction 50 works where the projection or post is round; however, if the post is other than round, the pipe jack does not fit snugly and leaks result.

Thus, for other than round posts, another waterproofing construction is used, an example of which is depicted in FIG. 2 and is commonly referred to as "Pitch Pocket." This term describes the encasing of an odd-shaped penetration (such as a steel angle iron support) in a pool of asphalt that is held in a metal bowl mounted onto the roof. When the asphalt dries or cools the penetration located inside of it is tightly encased to prevent water penetrating into the building.

Referring to FIG. 2, a method of installing the Pitch Pocket will now be described with the construction being shown generally at 76. A steel angle iron brace (support or post) 80 with a four hole mounting plate 84 welded thereto is bolted with bolts 88 to a roof deck 90. A sheet metal contractor slides a four-sided metal pitch pan 92 over the top of the brace 80. The pan 92, which is at least two inches deep, hangs loose waiting for a later installation step. The roofing contractor installs first ply layers (typically three) of roofing materials under the pitch pan 92 and onto the entire building roof. He then nails the flange 94 of the pan 92 onto the roof deck and through the ply layers. Roofing plies will

be striped or layered over the flange 94 to laminate the flange between the roofing plies. A finish coat of roofing materials 96, such as gravel or granule rolled roofing, is installed. Hot asphalt 98 or other pourable sealer is then poured into the pitch pan 92 until full and with a minimum two inch depth, and the asphalt is allowed to cool.

Pitch Pockets (76) work well until the asphalt shrinks or cracks and the pan or concave bowl fills with water. This cracking can be caused by the sun's direct heat, by impact on the post construction, by strong winds or by the building shaking as from an earthquake. When the cracks form, the water in the pocket is funneled into the building, resulting in the problem which the Pitch Pocket was specifically provided to prevent. Also, since the post is fixed in place by the asphalt, when a strong force is exerted on the post, the asphalt around the post compresses, loosening the securement of the post relative to the roof, and requiring repair.

SUMMARY OF THE INVENTION

According to one embodiment of a waterproof roof deck post of the invention, a deck post having a non-circular cross-section is secured relative to a roof deck. A sleeve surrounds the lower portion of the deck post. A waterproofing assembly has a collar and a skirt. The collar has an opening that is generally the same non-circular cross-section as that of the deck post. The deck post is disposed in the collar's opening. The collar is formed as a plug that is separate from the skirt. The collar is adapted to be fitted into an opening in the skirt. The skirt may be connected to the collar with a series of flanged tabs on the top portion of the skirt being inserted into a series of tab receiving cavities in the collar. The tabs may have projections used to increase the tabs' pull-out resistance. The collar surrounds the deck post above the top of the sleeve. The skirt extends down from the collar and out over the top of the sleeve. The skirt may have a split joint which locks together with a clasp and a locking slot on the skirt. The skirt may even be made up of a series of smaller skirt pieces that are joined together using their clasps and locking slots. A band surrounds the collar (perhaps situated in a recess formed in the collar of that purpose) and secures the collar to the deck post in a generally watertight manner.

According to another definition of the invention, disclosed herein are an improved waterproof deck post construction and method and a waterproofing assembly (or watertight umbrella) useful therein. The assembly has a collar with an opening therethrough and a skirt hanging down from the collar. The opening is configured to match the cross-sectional shape of the deck post, and this invention is thereby particularly well suited for deck posts which are not round. The assembly is preferably an elastomeric material or specifically is EPDM molded rubber.

The post is secured to the roof deck. A flanged sleeve is slid over the post, and the flange secured to the roof deck. The flanged sleeve can be a lead jack such as are used today on stink pipes and vent pipes. The waterproofing assembly is slid onto the post. With the collar surrounding the post just above the top of the sleeve and the skirt extending down over the top of the sleeve, a band is secured around the collar securing the collar in a watertight manner to the post. The band is preferably a hose clamp.

When the post is already secured to the deck and it is not convenient to slide the waterproofing assembly down over the post, an alternative embodiment of the waterproofing assembly of this invention is used. This embodiment has a split joint through the skirt and the collar which allows the

unit to be opened up and wrapped around the post. A watertight flap of the unit seals the joint closed. In this construction, a split lead flashing jack can be used as the flanged sleeve. The flashing jack is opened up and wrapped around the post and its seam then soldered closed.

The shape of the opening of the collar is selected to match the shape of the outside surface of the post. For example, it can be an L or a square shape. The skirt can have the same configuration for all post shapes. Thus, another embodiment of the waterproofing assembly constructs the skirt and collar as separate pieces with an inventory of collars having different opening shapes provided. The collar with the desired opening shaped to match the post being used will be selected and plugged into the skirt. In other words, the detachable EPDM collars or inserts are interchangeable to allow various geometric shapes. This plug-type collar and skirt can have split joints allowing them to be wrapped around the post. Additionally, the collar can have a longer configuration to accommodate two hose clamps, one above the other, if desired.

Other objects and advantages of the present invention will become more apparent to those persons having ordinary skill in the art to which the present invention pertains from the foregoing description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective cut-away view of a round post roof-mounted construction of the prior art;

FIG. 2 is a perspective cut-away view of an angle iron brace roof-mounted ("Pitch Pocket") construction of the prior art;

FIG. 3 is a side elevational view of a waterproof roof deck construction of the present invention;

FIG. 4 is an enlarged top plan view of the construction of FIG. 3;

FIG. 5 is a reduced cross-sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is an enlarged top plan view of FIG. 5;

FIG. 7 is a perspective, partially cut-away view of the construction of FIG. 3, but without the hose clamp for illustrative purposes;

FIG. 8*a* is a top plan view of the waterproofing assembly of the construction of FIG. 7;

FIGS. 8*b* and 8*c* are first and second alternative designs, respectively, of the unit of FIG. 8*a* to accommodate posts of different corresponding cross-section configurations;

FIG. 9 is a side elevational view of an alternative waterproofing assembly of the present invention usable in the construction of FIG. 3, for example;

FIG. 10 is a top plan view of the unit of FIG. 9;

FIG. 11 is a cross-sectional view taken on line 11—11 of FIG. 10;

FIG. 12 is a side elevational view of a construction assembly of the present invention used to support rooftop fencing or screening structure;

FIG. 13 is a side elevational view of the assembly of FIG. 12;

FIG. 14 is a view similar to FIG. 9 illustrating an open seam waterproofing assembly of the present invention;

FIG. 15 is a top elevational view of the unit of FIG. 14;

FIG. 16 is a view similar to FIG. 15 illustrating the unit in an open position;

FIG. 17 is an enlarged view illustrating a portion of the seam of FIG. 14;

FIG. 18 is a view similar to FIG. 14 illustrating an alternative waterproofing assembly of the present invention;

FIG. 19 is a side elevational view of the plug of the assembly of FIG. 18;

FIG. 20 is a top plan view of the plug of FIG. 19;

FIG. 21 is a top plan view of the assembly of FIG. 18 without the plug and in an open position;

FIG. 22 is an enlarged view of a portion of the seam of FIG. 18;

FIG. 23 is a side elevational view of another alternative waterproofing assembly of the present invention similar to that of FIG. 18 but with a detachable plug configured to accommodate two hose clamps as shown;

FIG. 24 is a top plan view of the unit of FIG. 23 with the hose clamps;

FIG. 25 is a side elevational view of the plug of the unit of FIG. 23 illustrated in isolation;

FIG. 26 is a side elevational view of a split lead pipe jack usable with the waterproofing assemblies of FIGS. 14, 18 and 23, for example, in a waterproof roof deck construction like that of FIG. 3;

FIG. 27 is a top plan view of the split lead pipe jack of FIG. 26;

FIG. 28 is a view similar to FIG. 14 of an alternative assembly;

FIG. 29 is a bottom plan view of the assembly of FIG. 28;

FIG. 30 is an enlarged, sectional bottom view of the slip joint of the assembly of FIG. 22;

FIG. 31 is cross-sectional view of the snap-in slip joint;

FIG. 32 is a side elevational view of an improved waterproofing assembly for use in a waterproof roof deck construction;

FIG. 33 is a top plan view of the skirt portion of the assembly of FIG. 32;

FIG. 34 is a bottom plan view of the collar plug portion of the assembly of FIG. 32;

FIG. 35 is a side elevational view of an improved waterproofing assembly as shown in FIG. 32, but with a split joint for retrofitting the skirt;

FIG. 36 is a top plan view of the skirt shown in FIG. 35;

FIG. 37 is a top plan view of the skirt shown in FIG. 35, before the skirt is formed into its generally cylindrical shape by locking its clasp into its locking slot;

FIG. 38 is a detailed view of the locking slot of FIG. 37;

FIG. 39 is a detailed view of the clasp of FIG. 37;

FIG. 40 is another detailed view of the clasp of FIG. 37;

FIG. 41 is a top plan view of the skirt portion of FIG. 32 when the skirt is formed with a series of skirting pieces locked together; and

FIG. 42 is a top plan view of an alternative design for the waterproofing assembly that accommodates two posts.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Referring to the drawings, a waterproof roof deck post construction of the present invention is illustrated generally at **100**. The method of constructing it is quick and easy. The steel contractor bolts the post **104** with a four-hole mounting bracket **108** welded thereto to the roof deck **112** using bolts **116**. The post **104** can have generally any cross-sectional

shape (unlike the prior art construction of FIG. 2) including non-round shapes. An "L" shape is illustrated by post **104**, which more specifically is an angle iron brace. The steel contractor then slides a lead pipe jack **124**, a waterproofing assembly **128** of the present invention and a stainless steel hose clamp **132** over the top of the brace or post **104** and lets them fall to the deck for later installation.

Next, the roofing contractor installs roofing plies (typically three plies) over the entire building. He nails with nails **140** (FIG. 6) the flange **144** of the lead pipe jack **124** through the ply layers and into the roof deck **112**. The lead pipe jack **124** will typically have a three or four inch diameter and a four pound lead thickness. Instead of a lead jack, a cheaper standard galvanized steel roof jack can be used. Roofing plies **150** are stripped over the flange **144** thereby laminating the flange into the roof system. The finish layer of roofing materials (such as gravel or granule roll roofing) are installed over the ply layers.

The roofing contractor then slides the waterproofing assembly **128** over the leak flashing with its cone shape facing down. The stainless steel hose clamp **132** is placed in position on the waterproofing assembly and the clamp **158** tightened down. FIG. **5** shows dimensions **162, 166, 170, 174, 178, 182, 186, 190, 192, 194, 196, 198, 200, 202, 204** of 6.27, 3.64, 0.20, 0.07, 5.27, 0.25, 2.54, 0.80, 0.53, 0.07, 0.75, 3.04, 0.20, 1.50, and 7.87 inches, respectively. These are just sample dimensions, however, and it is within the scope of the invention to change dimensions, style, materials and heights above the roof deck as would be apparent to those skilled in the art.

The waterproofing assembly **128** is shown in isolation in FIGS. **9, 10** and **11**. It is seen therein that it has a collar portion **210** having an opening **214** therethrough, a downwardly-depending skirt **218**, a shoulder **222** connecting the collar with the skirt, and a top rim or flange **226**. These components according to one embodiment of this invention are integrally formed of EPDM molded rubber in a thermal process. This elastomeric construction allows the collar portion **210** to be squeezed by the hose clamp **132** to secure in a watertight manner the collar to the post **104**, preventing water from leaking between the opening and the post. Sample dimensions **230, 234, 238, 242, 246, 250, 254** and **260**, 0.51, 0.06, 1.00, 0.25, 3.11, R2.15, R2.63 and R1.50 inches, respectively, are shown in these figures.

The opening **214** will be configured to have the same shape as the cross-section of the post (brace) **104** to which it is to be attached. Common shapes for the openings **214** are illustrated in FIGS. *8a*, *8b* and *8c* as L shaped, square and hexagonal, respectively, at **214***a*, **214***b* and **214***c*.

If a post **104** (angle iron or other shaped brace) is already on a building and the waterproofing assembly **128** cannot be slid into position, a retrofit waterproofing assembly of this invention can be used as depicted in FIGS. **14–16** generally at **270**. It has sample dimensions **274, 278, 282, 286, 290, 294** and **296** of 0.51, 0.06, R1.38, R1.50, R2.15, R2.63 and 2.10 inches, respectively. It is used together with a split lead flashing jack (which is a commercially available product) as illustrated generally at **300** in FIGS. **26** and **27**. As shown in FIGS. **26** and **27**, the split lead flashing jack **300** has a bottom flange **304** at the bottom of the sleeve **308**, and an open seam **312** extends all of the way down the side. The split lead jack **300** can be a standard jack which is cut at the site to allow installation or it can be a special pre-cut jack. The split lead jack **300** has sample dimensions **320, 324, 326, 328, 332** and **334** of 15.50, 8.00, .125, R7.750 and R1.750, R1.813 inches, respectively.

The lead jack **300** is pulled open and wrapped around the existing support post (**104**). The lead metal of the jack **300** is soft enough to allow the jack to be opened and closed without using a separate hinge. The open seam **312** is then silver soldered closed with a propane torch. Lead material **338** overlaps to facilitate soldering.

Similar to construction **100**, the roofing contractor installs his ply sheets and the flange **304** of the lead jack **300** is nailed through the ply sheets to the roof deck. Extra ply sheets are stripped over the flange to laminate it into the roof systems. The finish layer of roofing materials are installed onto the roof plies.

The retrofit collar **338** and skirt **340** of retrofit waterproofing assembly **270** is opened on its seam **342** and fit around the support post (**104**). With the assembly in place, the slip joint **344** on the collar **338** and skirt **340** is slid or snapped into place. The watertight flap **360** will be positioned facing downward, as shown in FIG. **17**. A stainless steel hose clamp (**132**) is then positioned on the collar and clamped tight.

The support post construction (**100**) of this invention using either waterproofing assembly **128** or retrofit waterproofing assembly **270** can be used to support generally any rooftop construction as is done today. An example is to support fencing or an equipment screen, as shown in FIGS. **12** and **13** generally at **380**. Roof-mounted equipment fences or screens are often used at the perimeters of buildings to hide roof mounted machinery from ground view. The design as shown uses four front upright posts **384, 386, 388, 390** and four angled constructions **392** of this invention. The four front upright posts **384, 386, 388, 390** are mounted about sixteen inches apart as shown by dimension **400**. The angled (angle iron brace) constructions **392** are at a forty-five degree angle and are welded at their tops to the upright constructions. They have a forty-five degree lead jack **404** and use the same waterproofing assemblies **128** or **270** as discussed above.

The collar portion of the waterproofing assembly can be formed as a separate unit from the skirt portion as shown in FIGS. **18–21** by waterproofing assembly **420**. This can be for the standard or for the open-seam wrap around embodiments. This has the advantage that a single skirt portion **424** can be used for all types and shapes of support posts (**104**), and it is only the collar portion **428** with its different shapes of openings **432** (see FIGS. *8a*, *8b* and *8c*) which varies. The separate collar **428** then acts like a plug to fit into the opening **436** at the top of the skirt **424** when pulled open as shown in FIG. **21**. The collar **428** has a parting line **438** which opens to allow for installation. The slip joint **440** and watertight flap **442** are illustrated in the enlarged view of FIG. **22**. Preferred dimensions **444, 446, 448, 450** are 0.51, 0.06, R1.38 and R1.48 inches, respectively. The (stainless steel) hose clamp (**132**) compresses and secures the plug **428** in place relative to the skirt **424** and the post (**104**). If needed, two clamps can be used, one above the other, as shown in FIG. **23** by hose clamps **452, 454**. The two clamp embodiment will likely require a longer or taller collar (plug) **460** as depicted in FIG. **25**.

The rim or flange **464** on the plug **460** allows for a positive stopping point when installing it into the construction. Also, it is a good waterproofing technique to let water that is flowing off the top of the plug **460** pass over the seam **470** of the collar and not into the seam. The flange **464** will overlap to the outside of the base of the collar.

FIGS. **28** and **29** show generally at **500** an alternative retrofit waterproofing assembly of this invention. It includes a slip joint **504** on the collar **508** and skirt **512**. FIG. **30** is

an enlarged view of the upper right portion of FIG. 29 showing in greater detail the slip joint 504 which allows the collar 508 to open.

Referring now to FIG. 31, an assembled EPDM rubber snap joint with flap is illustrated generally at 520 with the male insert 524 snapped with snap 528 into the female adapter 532. It functions generally similar to a ZIP LOCK bag. Unlike a typical plastic ZIP LOCK bag, the present assembly is made of rubber and its cross-section is different. Also, the snap and adapter areas are preferably made using a harder rubber than the rubber in the base collar. The collar is manufactured laying flat and then turned around to the point that the snap joint 520 can be pushed in by finger pressure. This is the only known roofing product that locks in place without tools.

Thus, the waterproof roof deck post constructions of this invention do not deform or shrink and thus prevent water from flowing into the roof penetration. Unlike the asphalt of the prior art Pitch Pocket, the waterproofing assembly will not crack over time requiring maintenance. The present constructions are also considerably cheaper and more attractive than the Pitch Pocket design. Additionally, the constructions of this invention are easier and quicker to install.

Also described herein is a waterproofing assembly 600, which includes several improvements to the waterproofing assembly 128 and the retrofit waterproofing assembly 270 (or 420). Although an improved waterproof roof deck post construction is described herein, construction details, methods and alternatives as previously described for other embodiments may be incorporated herein for this embodiment as would be apparent to those skilled in the art. Referring to FIG. 32, as with waterproofing assembly 420, the collar 605 of the improved waterproofing assembly 600 can be formed as a separate unit from the skirt 610. Again, this has the advantage that a single skirt 610 can be used for all types and shapes of support deck posts (104). Only the collar 605 with its different shapes of openings (see FIGS. 8*a*, 8*b* and 8*c*) varies. The collar 605 acts like a plug by fitting into the skirt opening 615. The collar 605 can also be constructed to accept more than one support deck post. For example, FIG. 42 shows a collar 605 with openings 214*d* and 214*e* to accept two L-shaped deck posts. The collar 605 and the skirt 610 can be formed of E.P.D.M. (Ethylene Propylene Diene Terpolymer) rubber.

In the improved waterproofing assembly 600, the collar 605 connects to skirt 610 by inserting a series of flanged tabs 620 located on the top circumferential shoulder of the skirt 610. In one embodiment, there are five flanged tabs. Other embodiments have more or fewer flanged tabs 620. The flanged tabs 620 allow the skirt 610 to wrap around a full three hundred and sixty degrees without distortion. In the previous waterproofing assemblies, which lacked the flanged tabs, there is a possibility that the skirt may distort and not bend well. The flanged tabs 620 minimize this problem.

To further improve the connection of the skirt 610 to collar 605, the collar may be provided with a series of tab-receiving cavities 625. In such an assembly, the flanged tabs 620 are inserted each into a tab-receiving cavity 625 to connect collar 605 with skirt 610. In another embodiment, the flanged tabs 610 may each also be provided with a projection 630. The flanged tabs 610 are inserted into the tab-receiving cavities 625 past the point of the projections 630. The projections 630 increase the pull-out resistance of the collar 605 from the skirt 610, thereby improving the connection of the collar 605 to the skirt 610.

As a further improvement, collar 605 may be built with a clamping recess 635 molded around the circumference of the collar 605. The hose clamp (132) or other such band can be placed within the clamping recess 635 before it is tightened to secure the collar 605 and skirt 610 about the deck post (104).

In prior embodiments, the collar or skirt may have been created with a split joint so that the waterproofing assembly could be retrofitted around a deck post (see FIGS. 14-17). In the retrofitted assembly, the collar and the skirt have split joints so that they can 17). In the retrofitted assembly, the collar and the skirt have split joints so that they can be wrapped around the deck post and then secured closed. Another improvement to the waterproofing assembly in one embodiment is the use of an improved system to securely close the skirt. In FIGS. 35 and 36, there is a skirt 610 with a split joint 640. FIG. 37 shows the skirt 610 in its state prior to being wrapped around a deck post and secured close. The split joint is closed by inserting the clasp 650 into the locking slot 645. When locked, the split joint is generally waterproof. The clasp 650 and locking slot 645 may be designed in several configurations. One such configuration is to have the clasp 650 shaped as a rectangular wedge and the locking slot 645 designed so that the rectangular wedge is forced through the locking slot's rectangular hole, locking the split joint. FIGS. 38 through 40 show the clasp 650 and locking slot 645 in greater detail.

The use of clasp 650 and locking slot 645 to close the split joint has another advantage, as can be understood from FIG. 41. In one embodiment, more than one skirt (referred to herein as 'skirting pieces') 610 can be connected together to form a larger overall skirt. In FIG. 41, two skirting pieces 610.1 and 610.2 are connected together to form a skirt. The clasp of skirting piece 610.1 has been forced into the locking slot of skirting piece 610.2 and the clasp of skirting piece 610.2 has been forced into the locking slot of skirting piece 610.1 so that the two skirting pieces form one skirt. By linking skirts together, one can increase the diameter of the skirt.

An advantage to this system is that different sizes of collars can be manufactured for use with smaller and larger deck posts. These various sized collars can all be assembled using just one size of skirt. For smaller collars, just one skirting piece is used to form the skirt. For larger collars, two or more skirting pieces are interconnected to form the skirt. For example, a small plug (perhaps with five tab-receiving cavities) may be used for waterproofing 2" by 2" metal deck posts using a single skirting piece for the skirt. A larger plug (perhaps equipped with ten tab-receiving cavities) may be manufactured for waterproofing 4" by 4" metal deck posts using two skirting pieces linked together as the skirt. Using this methodology, even larger plugs could be created to support more than two skirting pieces linked together.

In summary, disclosed herein are geometric collars created to waterproof various non-standard geometric shaped roof penetrations, such as fence posts, signs, and parapet wall supports. The construction of these collars are unique because they fit around existing roof penetrations by splitting apart, so that they can then wrap around roof penetrations, and locking onto them. This assembly creates a watertight umbrella, and watertight umbrellas are recommended in the roofing industry for counter flashing, standard flashings or roof jacks.

These geometric collars also fulfill N.R.C.A. (National Roofing Contractors Association) requirements. *The Handbook of Accepted Roofing Knowledge* (HARK) page 7,

Section VIII., *Mechanical Curbs and Penetrations states*: "The use of so-called 'pitch boxes' or 'pitch pockets' around penetrations should be avoided because they pose a constant maintenance problem." The present geometric collars are a low cost method for eliminating Pitch Pockets, as shown in FIG. 2. By utilizing a two or three piece design the size of the collar can be expanded to accommodate many different roof penetration sizes. Also, the diameter of the umbrella cone can be expanded by attaching two skirts together and using a larger diameter geometric plug.

From the foregoing detailed description, it will be evident that there are a number of changes, adaptations and modifications of the present invention which come within the province of those skilled in the art. However, it is intended that all such variations not departing from the spirit of the invention be considered as within the scope thereof.

What is claimed is:

1. A waterproof roof deck post construction, comprising:
   - a deck post having a cross-section and secured relative to a roof deck;
   - a sleeve surrounding a lower portion of the deck post; and
   - a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the deck post, the deck post being disposed in the opening, the collar formed as a plug, which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt, the collar surrounding the deck post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;
   - wherein the skirt includes a circumferential shoulder having a plurality of flanged tabs for connecting the collar and the skirt.

2. The construction of claim 1 wherein the cross-section of the desk post is non-circular.

3. The construction of claim 1 wherein the collar is fitted with a series of tab-receiving cavities for accepting the plurality of flanged tabs.

4. The construction of claim 1 wherein the flanged tabs each include a projection for increasing the pull-out resistance between the connection of the collar and the skirt.

5. The construction of claim 1 further comprising a band surrounding the collar and securing in a generally watertight manner the collar to the deck post.

6. The construction of claim 5 wherein the collar includes a clamping recess for accepting the band surrounding the collar.

7. The construction of claim 1 wherein the skirt includes a split joint through the skirt, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, for closing the split joint in a generally watertight manner.

8. The construction of claim 7 wherein the clasp is a rectangular wedge.

9. The construction of claim 1 wherein the skirt includes a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, the skirting pieces interconnected in a generally watertight manner to form the skirt by locking the clasp of one skirting piece to the locking slot of an adjoining skirting piece.

10. The construction of claim 1 wherein the deck post defines a first deck post, and further comprising a second deck post having a cross-section and secured relative to a roof deck, and wherein the collar has an opening having generally the same cross-section as that of the second deck post.

11. A waterproofing assembly, comprising:
   - a collar for surrounding a deck post and being secured thereto in a generally watertight manner;
   - a skirt extending down from the collar and out over the deck post; and
   - the collar being formed as a plug which is a separate piece from the skirt and is adapted to be fitted into an opening in the skirt;
   - wherein the skirt includes a circumferential shoulder having a plurality of flanged tabs for connecting the collar and the skirt.

12. The waterproofing assembly of claim 11 wherein the collar is fitted with a series of tab-receiving cavities for accepting the plurality of flanged tabs.

13. The waterproofing assembly of claim 11 wherein the plurality of flanged tabs each include a projection for increasing the pull-out resistance between the interconnection of the collar and the skirt.

14. The waterproofing assembly of claim 11 wherein the collar has an opening having generally the same non-circular cross-section as that of the deck post.

15. The waterproofing assembly of claim 11 further comprising a band surrounding the collar and securing the collar to the deck post in a generally watertight manner.

16. The waterproofing assembly of claim 15 wherein the collar includes a clamping recess for accepting the band surrounding the collar.

17. The waterproofing assembly of claim 11 wherein the skirt includes a split joint through the skirt, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp for closing the split joint in a generally watertight manner.

18. The waterproofing assembly of claim 17 wherein the clasp is a rectangular wedge.

19. The waterproofing assembly of claim 11 wherein the skirt is made from a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, and the skirting pieces interconnected in a generally watertight manner to form the skirt by locking the clasp of one skirting piece to the locking slot of the adjoining skirting piece.

20. The waterproofing assembly of claim 11 wherein deck post defines a first deck post, and the collar further has a second opening having generally the same cross-section as that of a second deck post.

21. The waterproofing assembly of claim 11 wherein the deck post is a roof deck post.

22. A method of constructing a waterproof roof desk post construction, comprising:
   - (a) securing a deck post having a cross-section to a roof deck;
   - (b) securing a sleeve surrounding a lower portion of the deck post;
   - (c) providing a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the deck post; the collar formed as a plug which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt; and
   - (d) positioning the waterproofing assembly such that the deck post extends through the opening in the collar and the skirt extends down over a top of the sleeve;
   - wherein the providing a waterproofing assembly includes providing a circumferential shoulder on the skirt, the circumferential shoulder including a plurality of flanged tabs for connecting the collar and the skirt.

23. The method of claim 22 wherein the providing a waterproofing assembly includes fitting the collar with a series of tab-receiving cavities for accepting the plurality of flanged tabs.

24. The method of claim 22 wherein the providing a waterproofing assembly includes providing a projection on each of the plurality of flanged tabs, the projections increasing the pull-out resistance between the connection of the collar and the skirt.

25. The method of claim 22 further comprising applying a band around the collar to secure the collar in a generally watertight manner to the deck post.

26. The method of claim 25 wherein the applying a band around the collar includes applying the band within a clamping recess on the collar.

27. The method of claim 22 wherein the providing a waterproofing assembly includes providing a split joint through the skirt, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, for closing the split joint in a generally watertight manner.

28. The method of claim 27 wherein the providing a waterproofing assembly includes providing the clasp in a rectangular wedge form.

29. The method of claim 22 wherein the providing a waterproofing assembly includes providing the skirt made from a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, and interconnecting the skirting pieces in a generally watertight manner to form the skirt by locking the clasp of one skirting piece to the locking slot of the adjoining skirting piece.

30. The method of claim 22 wherein the deck post defines a first deck post, and further comprising securing a second deck post having a cross-section to a roof deck; and wherein the providing a waterproofing assembly includes the collar having a second opening having generally the same cross-section as that of the second deck post.

31. A method of constructing a waterproof roof desk post construction, comprising:

(a) providing a sleeve surrounding a lower portion of a deck post secured to a roof deck, the deck post having a non-circular cross-section;

(b) providing a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same non-circular cross-section as that of the deck post, the collar formed as a plug which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt; and

(c) positioning the waterproofing assembly such that the deck post extends through the opening in the collar and the skirt extends down over a top of the sleeve;

wherein the providing a waterproofing assembly includes providing a circumferential shoulder on the skirt, the circumferential shoulder comprised of a plurality of flanged tabs, and connecting the collar to the skirt with the flanged tabs.

32. The method of claim 31 wherein the providing a waterproofing assembly includes providing the collar with a series of tab-receiving cavities and connecting the collar to the skirt by inserting the flanged tabs into the tab-receiving cavities.

33. The method of claim 31 wherein the providing a waterproofing assembly includes providing a projection on each of the plurality of flanged tabs, and inserting the flanged tabs on the skirt into the collar past the location of the projections on the flanged tabs so that the pull-out resistance between the collar and the skirt is increased.

34. The method of claim 31 further comprising after positioning the waterproofing assembly, applying a band around the collar to secure the collar in a generally watertight manner to the deck post.

35. The method of claim 34 wherein the applying a band around the collar includes placing the band within a clamping recess on the collar and then securing the band to the collar.

36. The method of claim 31 wherein the providing a waterproofing assembly includes the steps of providing a split joint through the skirt; the split joint including a clasp and a locking slot, opening the split joint, wrapping the skirt around the deck post at the top of the sleeve and locking the skirt in a generally watertight manner by inserting the clasp into the locking slot.

37. The method of claim 31 wherein the providing a waterproofing assembly includes the steps of providing a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, and then forming the skirt around the deck post at the top of the sleeve by locking the skirting pieces together in a ring formation by locking the clasp of one skirting piece into the locking slot of the adjoining skirting piece.

38. The method of claim 31 wherein the deck post defines a first deck post, the opening defines a first opening and the providing a waterproofing assembly includes the collar having a second opening having generally the same cross-section as that of a second deck post.

39. A waterproof roof deck post construction, comprising:

a deck post having a cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the deck post; and

a waterproofing assembly including a collar and a frusto-conical skirt, the collar having an opening having generally the same cross-section as that of the deck post, the deck post being disposed in the opening, the collar formed as a plug, which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt, the collar surrounding the deck post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

the skirt having a single split joint angled relative to a longitudinal axis of the skirt, allowing the collar and skirt to be opened up, wrapped around an elongate member securable to a roof deck, and closed in a watertight manner with a male-female arrangement and with the collar generally above the skirt and secured thereto.

40. A waterproof roof deck post construction, comprising:

a deck post having a cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the deck post; and

a waterproofing assembly including a collar and a frusto-conical skirt, the collar having an opening having generally the same cross-section as that of the deck post, the deck post being disposed in the opening, the collar formed as a plug, which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt, the collar surrounding the deck post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

wherein the skirt includes a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, the

skirting pieces interconnected in a generally watertight manner to form the skirt by locking the clasp of one skirting piece to the locking slot of an adjoining skirting piece.

41. The construction of claim 40 wherein the cross-section is non-circular.

42. A method of constructing a waterproof roof desk post construction, comprising:

(a) providing a sleeve surrounding a lower portion of a deck post secured to a roof deck, the deck post having a cross-section;

(b) providing a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the deck post, the collar formed as a plug which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt; and

(c) positioning the waterproofing assembly such that the deck post extends through the opening in the collar and the skirt extends down over a top of the sleeve;

wherein the providing a waterproofing assembly includes providing a plurality of skirting pieces, the skirting pieces each having a split joint through the skirting piece, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, and then forming the skirt around the deck post at the top, of the sleeve by locking the skirting pieces together in a ring formation by locking the clasp of one skirting-piece into the locking slot of the adjoining skirting piece.

43. The method of claim 42 wherein the cross-section is non-circular.

44. A waterproof roof deck post construction, comprising:

a deck post having a cross-section and secured relative to a roof deck;

a sleeve surrounding a lower portion of the deck post; and

a waterproofing assembly including a collar and a skirt, the collar having an opening having generally the same cross-section as that of the deck post, the deck post being disposed in the opening, the collar formed as a plug, which is a separate piece from the skirt and adapted to be fitted into an opening in the skirt, the collar surrounding the deck post above a top of the sleeve, and the skirt extending down from the collar and out over the top of the sleeve;

wherein the skirt includes a single split joint through the skirt, the split joint including a clasp and a locking slot, the locking slot fitted for the clasp, for closing the split joint in a generally watertight manner, the skirt being a continuous solid piece from one side of the split joint to the other; and

wherein the skirt includes a circumferential shoulder having a plurality of flanged tab for connecting the collar and the skirt.

45. The construction of claim 44 wherein the collar is fitted with a series of tab-receiving cavities for accepting the plurality of flanged tabs.

46. The construction of claim 44 wherein the flanged tabs each include a projection for increasing the pull-out resistance between the connection of the collar and the skirt.

47. The construction of claim 46 wherein the clasp is a rectangular wedge.

* * * * *

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(12) **United States Patent**
Bishop

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(45) **Date of Patent: Nov. 18, 2003**

(54) **DRAIN PIPE CONNECTOR**

(75) Inventor: **Bernard Bishop**, Des Plaines, IL (US)

(73) Assignee: **Portals Plus, Inc.**, Bensenville, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 130 days.

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(52) **U.S. Cl.** **52/302.1**; 285/42; 277/608; 210/163
(58) **Field of Search** 52/302.1; 285/42; 277/608; 210/163

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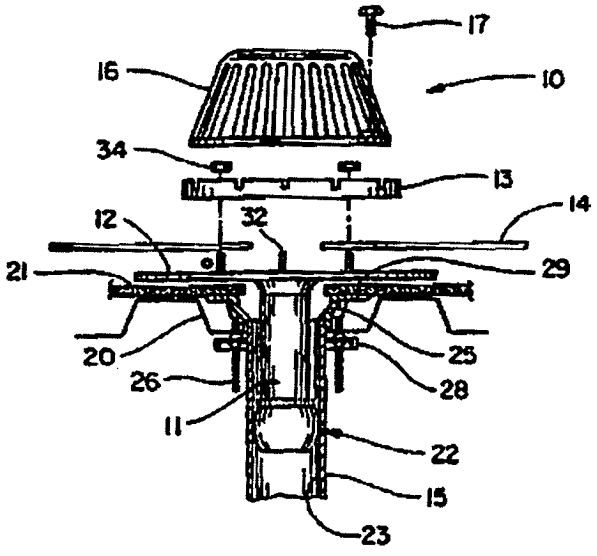
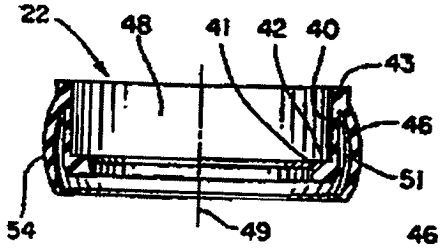
Primary Examiner—Jeanette Chapman
(74) *Attorney, Agent, or Firm*—Dillis V. Allen, Esq.

(57) **ABSTRACT**

A means to engage two vertical pipes or tubes of unlike and increasing size that have been co-inserted such as with a roof or floor drain, in a manner that prevents the contained fluid from overspilling when the said pipes become full or when the fluid flows in a direction opposite from normal gravity flow, which is generally considered as flow from the smaller to the larger pipe. The means of engagement closes the void between the inside diameter larger pipe and outside diameter smaller pipe to withstand fluid pressure in a way that accounts for angular misalignment, pipe or tube eccentricity, manufacturing tolerance, as well as tube condition and debris attached to either pipe sidewall. More specifically, a roof drain system for existing roofs or new construction including a flanged outlet pipe for insertion into the roof drain pipe with the flange mounted on top of the roof. A water straining system is mounted on top of the flange. The outlet pipe is sealed to the interior of the drain pipe by a one-piece rubber molding seal that flexes to easily slide into the drain pipe and withstands high backup water pressures from the drain pipe without leaking. The seal has a Shore A durometer in the range of 30 to 95 and has an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from the upper end of the annular portion that seals the inner surface of the drain pipe.

13 Claims, 2 Drawing Sheets





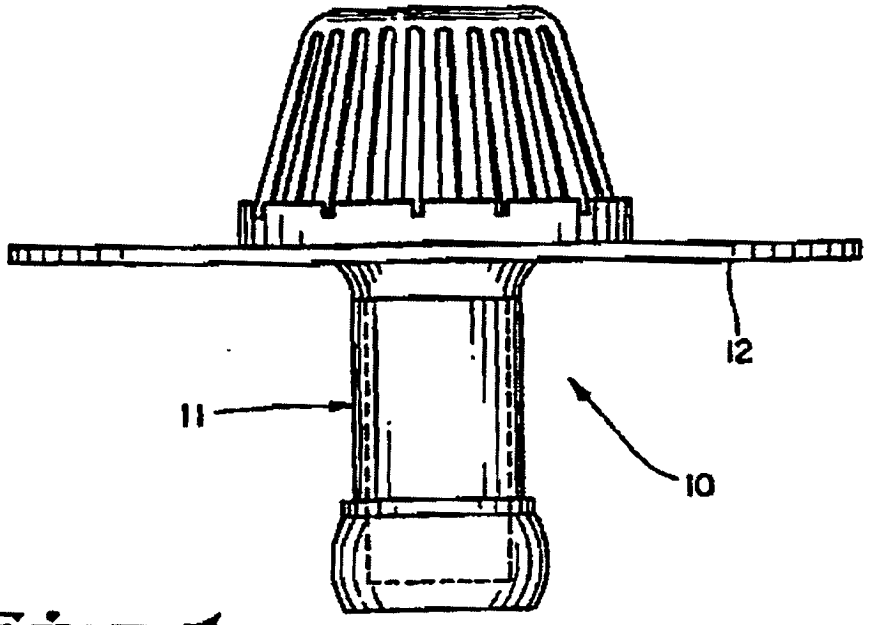


Fig. 1

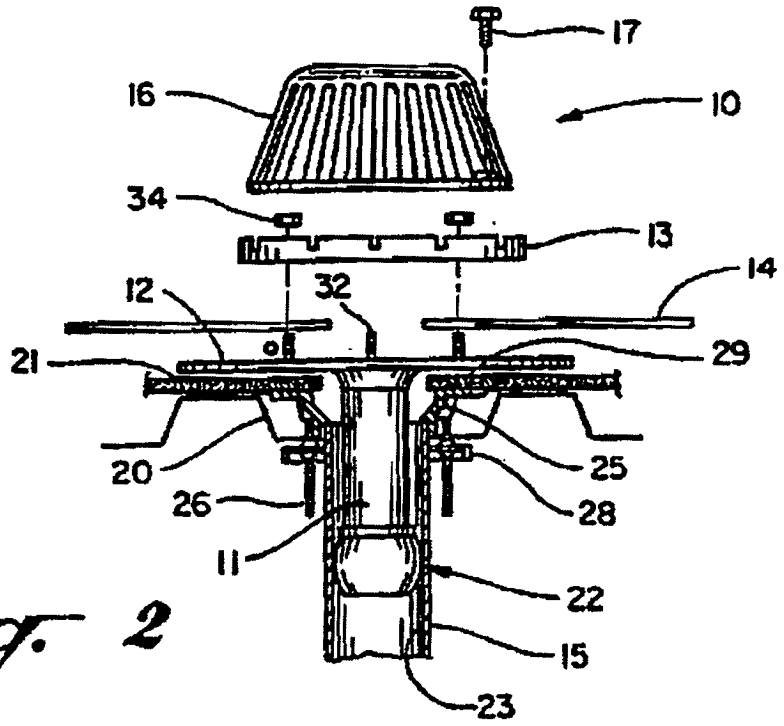


Fig. 2

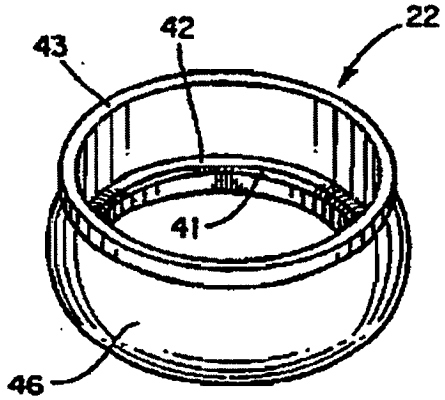


Fig. 3

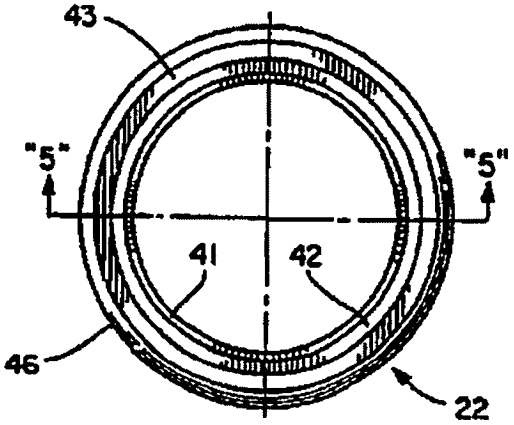


Fig. 4

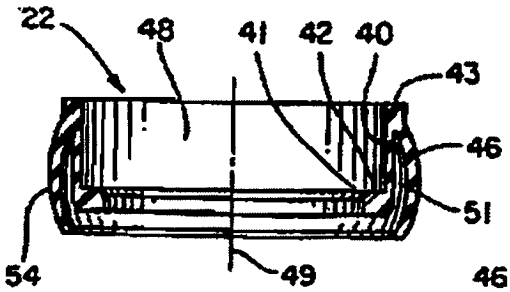


Fig. 5

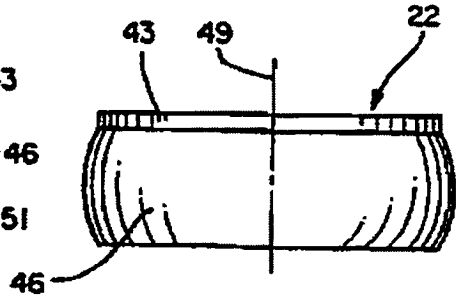


Fig. 6

DRAIN PIPE CONNECTOR

BACKGROUND OF THE INVENTION

The present invention relates to a flexible membrane device that assumes the gap between two unlike sized pipes or tubes, where as the smaller of the two pipes is inserted vertically downward into the larger pipe and the flexible membrane prevents egress of internal fluids outside of the pipe confines if, for example, the pipes become full and fluid pressure occurs, or if fluid flow direction is reversed and velocity pressure occurs. More specifically, the present invention relates to roof draining systems that are adapted to be retrofitted into existing roof drain pipes usually at the time the roof is re-roofed. It should be understood, however, that the principles of the present invention can be utilized in new construction as well as in re-roofing systems. Generally, re-roofing drain systems include an outlet pipe having an upper flange mountable on roof insulation or roofing material. In some cases, the outlet pipe is sealed to the interior of the drain pipe by a pre-compressed foam material but other forms of seals described below have been used as well. A rib on the top of this flange sometimes mates with a groove on a cast aluminum gravel guard collar, which in essence is a ring element that provides a flashing lock to the flange with a roofing membrane clamped between the collar and the flange. The flange and the outlet tube are frequently available in stainless steel, PVC, aluminum or high temperature ABS and are available to accommodate but not limited to 2, 3, 4, 5, and 6 inch drains. The drain can be installed on an existing roof top without special tools and the hardware is frequently stainless steel. A straining system is sometimes provided on top of the clamping ring that includes a one-piece dome-type strainer.

When re-roofing is necessary, the original drain systems must be replaced in part because of rusted bolts and frequently the gravel ring breaks upon removal.

The present invention relates particularly to the methodology for sealing the outlet pipe to the interior of the drain pipe. This is an essential function in re-roof drain systems because backup water pressure from the drain pipe, if it escapes around the outlet pipe, will find its way to an area underneath the roof and into the building interior.

One system for sealing designed by the assignee of the present invention is a pre-compressed foam tape glued to the exterior of the outlet pipe. Just prior to installation of the outlet pipe, the installer removes the pre-compressed tape permitting the foam to expand as the outlet pipe is inserted into the existing drain pipe. This system has been found satisfactory but in some cases, insertion into the drain pipe has been found difficult and if the outer diameter of the pre-compressed foam is decreased to facilitate insertion into the drain pipe, some leakage will occur particularly upon backup water pressures of 50 column feet or more. Immediately upon removing the tape and prior to the full expansion of the foam, the smaller pipe is inserted and positioned in the larger pipe. The foam continues to expand at a rate effected by ambient temperature and other conditions until restricted by the void between the two pipes. This system has been found satisfactory in some cases, but insertion into the drain pipe has been found difficult based on installer skill or speed, and ambient conditions. Unlike the present invention, this type seal may experience some leakage around the wrapped joint or through the foam material when subjected to fluid pressure.

Other roofing systems include one-piece rubber seals that are somewhat more relevant to the present invention than the above-described assignee's expandable foam system. One such seal is manufactured by Zurn Industries, Inc. of Pittsburgh, Pa., and it includes a one-piece elastomeric seal having a plurality of thin annular rings there-around that are integral with the seal.

Another re-roofing seal is made by Thaler Metal Industries, Inc., Model No. M-22, and this system includes a one-piece elastomeric seal constructed of EPDM Posiseal that is similar in construction to the Zurn seal described above.

U-Flow, Inc. has a mechanical compression seal adapter positioned immediately below the roof deck. This annular seal, Model Nos. UF-3 to UF-6 include a heavy annular section with an even heavier lower annular seal portion that engages the inside diameter of the drain pipe. This seal is largely inflexible. This seal requires axial compression with a plurality of threaded members after insertion into the drain pipe to effect radial expansion and sealing against the drain pipe, making it very difficult to operate and unpredictable. This product has a U.S. Pat. Nos. 4,505,499 and 4,799,713.

Marathon Roofing Products, Inc. of Buffalo, N.Y., has a U.S. Pat. No. 4,759,163, on a one-piece elastomeric seal that must be expanded in a similar manner to the U-Flow seal described above.

The RAC Roof Accessories Company, Inc., U.S. Pat. No. 5,141,633, includes a rubber seal to seal against back flow, constructed of a one-piece urethane member that extends below a frusto-conical lower end of the outlet pipe in the system that assists in urging the seal outwardly against the drain pipe. This seal is essentially just a thin annular ring except for the lower frusto-conical portion.

Other prior art utilizes a one-piece elastomeric seal having a plurality of thin annular rings there-around that are integral with the seal. One such manufacturer is Zurn Industries, Inc. of Pittsburgh, Pa. Another re-roofing seal is made by Thaler Metal Industries, Inc., Model No. M-22, and this system includes a one-piece elastomeric seal constructed of EPDM Posiseal that is similar in construction to the Zurn seal described above. Unlike the present invention, this type seal does not account for misalignment and could leak when witnessing high fluid pressure.

In all cases, prior art has shortcomings since each has its own unique problem with assembly methods, installer skill or tool requirements, self-alignment, and their inability to withstand high pressure when the drain becomes full and/or flow is reversed.

In short, the above prior art systems have been found to be both difficult to insert into the existing drain pipe and include difficult and complicated mechanisms for expanding the seal, and have not been found under testing to prevent leakage at backup pressures in excess of 50 column feet.

For the above reasons, it is a primary object of the present invention to provide a roof drain system with a seal for sealing the drain system to the drain pipe interior and eliminate the many problems noted above in prior art seals.

SUMMARY OF THE PRESENT INVENTION

In accordance with the present invention, a roof drain system is provided for existing roofs or new construction including a flanged outlet pipe for insertion into the roof drain pipe with the flange mounted on top of the roof. A water straining system is mounted on top of the flange. The outlet pipe is sealed to the interior of the drain pipe by a one-piece rubber molding seal that flexes to easily slide into the drain pipe and withstands high backup water pressures

from the drain pipe without leaking. The seal has a Shore A durometer in the range of 30 to 95 and has an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from the upper end of the annular portion that seals the inner surface of the drain pipe.

The present seal eliminates the necessity for complicated seal expanding components noted above in many of the prior art drain pipe sealing devices in roof drain systems. Toward these ends, the present seal includes the annular portion noted above that has a radial flange that engages the extreme lower end of the outlet pipe and this axially locates the seal with respect to the outlet pipe and furthermore resists upward movement of the seal relative to the outlet pipe upon backup water pressure in the drain pipe.

The seal is constructed of rubber but could also be constructed of other materials such as poly-urethane. It is a one-piece molding and the flange is spheroidal in configuration and has a radius of about 1.5 inches about a center spaced about 0.535 inches from the axial center line of the seal. In the 4 inch seal, i.e.; designed to seal against a 4 inch diameter drain pipe, the flange is flexible and forms a hydrostatic pocket between itself and the outer surface of the seal annular portion. Water pressure in this pocket serves to expand the frusto-spheroidal flange into engagement with the drain pipe interior as backup water pressure increases, providing a very effective seal and eliminating any seal leakage at backup pressures as high as 50 column feet or more.

Other objects and advantages of the present invention will appear more clearly from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front plan view of a roof drain system according to the present invention;

FIG. 2 is an exploded, partly in section view, of the roof drain system according to the present invention shown installed into an existing roof and drain pipe assembly;

FIG. 3 is a perspective view of the present roof drain seal;

FIG. 4 is a top view of the roof drain seal shown in FIG. 3;

FIG. 5 is a longitudinal section of the roof drain seal according to the present invention, and;

FIG. 6 is a front plan view of the roof drain seal according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings and particularly FIGS. 1 and 2, a roof draining system is illustrated generally designated by the reference numeral 10 and is seen to include an outlet pipe 11 adapted to be inserted into an existing drain pipe 15, having fixed thereto a flat upper annular flange 12, to which a gravel guard collar or ring 13 is fastened, clamping a roofing membrane 14 there-between, and a dome-type straining molding 16 fastened to the ring by a plurality of fasteners 17.

The existing roof construction illustrated in FIG. 2 includes a corrugated sheet metal roof 20 covered by an insulation panel 21.

The flange 12 is fixed to the upper end of the outlet pipe 11 and the outlet pipe 11 has an annular seal 22, according to the present invention, that seals the outlet pipe to drain pipe interior surface 23. The upper end of the drain pipe 15 carries a bell housing 25 that is attached thereto by a plurality of fasteners 26 that extend through a drain pipe collar 28 and into a bell housing flange 29.

The outlet pipe flange 12 has a plurality of fasteners 32 projecting upwardly therefrom that extend through gravel collar 13 and are attached thereto by a plurality of nuts 34.

As seen in FIGS. 3 to 6, the seal 22 is a one-piece elastomeric molding preferably constructed of EPDM rubber, but other materials such as polyurethane with a similar durometer could be substituted. The seal 22 has a Shore A durometer in the range of 30 to 95, but preferably about Shore A 55 to minimize back pressure leakage from the drain pipe 15.

The seal 22 includes an annular portion 40 that engages the outer diameter of the lower end of the outlet pipe 11 and annular portion 40 has an inner diameter slightly less than the outer diameter of the outlet pipe 11 to securely hold the seal on the end of the outlet pipe. To further axially position the seal 22 with respect to the outlet pipe, a radially inward directed rim portion 41 is provided on the lower end of the annular portion 40 and it has an upper surface 42 that engages the radial end surface at the lower end of the outlet pipe 11 and this design further assists in resisting back pressure or upward pressure on the seal 22 caused by back pressure in the drain pipe 15. The annular portion, including the rim 41, has an axial length of about 1.250 inches for the 4 inch model of the present drain seal(all dimensions herein are for the 4 inch model), and it should be understood that the seal assemblies for the other size drain pipes are proportionately similar. Annular portion 40 has a wall thickness of about 0.075 inches below a heavier annular upper portion 43, which has a thickness of about 0.200 inches. Just below annular portion 43, a semi-spheroidal annular flange portion 46 is provided that engages the inner surface 23 of the drain pipe 15 to seal the outlet pipe 11 to the drain pipe and prevent back leakage from the drain pipe upwardly into the roof area.

The flange portion 46 has a radius of about 1.500 inches (again in the 4 inch version) scribed about a center 48 that is offset radially from seal axis 49 about 0.535 inches. The flange portion 46 has a decreasing wall thickness from annular portion 43 to its end 49 beginning at approximately 0.125 inches, decreasing to about 0.080 inches. The flange portion 46 forms an annular pocket 51 between its inner surface and the outer surface of the annular portion 40 which provides a hydrostatic reservoir for water back pressure within the drain pipe 15. This hydrostatic pressure in pocket 51 forces the flange portion 46 radially outwardly against the interior 23 of the drain pipe 15 increasing the sealing characteristics of the seal in response to increasing water back pressure. The relaxed maximum outer diameter of the flange portion 46 taken at about 54 in FIG. 5 is 4.060 inches, somewhat greater than the interior diameter of 4.00 inches of the existing drain pipe.

What is claimed is:

1. A roof drain system for annular roof drain pipes connected to a generally flat roof, comprising: a drain outlet pipe adapted to be inserted into the annular roof drain pipe, said outlet pipe having a flange for attachment to the roof, and a seal on the outside of the outlet pipe having a relaxed diameter about the same as the internal diameter of the roof drain pipe, said seal being constructed of a molded elastomeric material having an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from an upper portion of the annular portion, and means for preventing backup water pressure from escaping around the seal including said

integral flange portion expanding against the roof drain pipe in response to backup water pressure against the inside of the integral flange portion.

2. A roof drain system as defined in claim 1, wherein the seal is constructed of a one-piece rubber elastomer having a Shore A durometer in the range of 30 to 95.

3. A roof drain system as defined in claim 1, wherein the seal has a Shore A durometer about 55.

4. A roof drain system as defined in claim 1, wherein the annular portion of the seal has an annular flange portion at the lower end thereof adapted to engage the lower end of the outlet pipe and to axially locate the seal relative to the outlet pipe.

5. A roof drain system as defined in claim 1, wherein the flange portion is semi-spheroidal in shape.

6. A roof drain as defined in claim 1, wherein the flange portion is arcuate in cross-section and has an inner surface radially spaced from the outer surface of the annular portion.

7. A roof drain system for annular roof drain pipes connected to a generally flat roof, comprising: a drain outlet pipe adapted to be inserted into the annular roof drain pipe, said outlet pipe having a flange for attachment to the roof, and a seal on the outside of the outlet pipe having a relaxed diameter about the same as the internal diameter of the roof drain pipe, said seal being constructed of a molded elastomeric material having an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from an upper portion of the annular portion, the seal being constructed of a one-piece rubber elastomer having a Shore A durometer in the range of 30 to 95, and the annular portion of the seal having an annular rim portion at the lower end thereof adapted to engage the lower end of the outlet pipe and to axially locate the seal relative to the outlet pipe, and means for preventing backup water pressure from escaping around the seal including said integral flange portion expanding against the roof drain pipe in response to backup water pressure against the inside of the integral flange portion.

8. A roof drain system for annular roof drain pipes connected to a generally flat roof, comprising: a drain outlet pipe adapted to be inserted into the annular roof drain pipe, said outlet pipe having a flange for attachment to the roof, and a seal on the outside of the outlet pipe having a relaxed diameter about the same as the internal diameter of the roof drain pipe, said seal being constructed of a molded elastomeric material having an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from an upper portion of the annular portion, the flange portion being semi-spheroidal in shape, and the flange portion being arcuate in cross-section and having an inner surface radially spaced from the outer surface of the annular portion, and means for preventing backup water pressure from escaping around the seal including said integral flange portion expanding against the roof drain pipe in response to backup water pressure against the inside of the integral flange portion.

9. A roof drain system for annular roof drain pipes connected to a generally flat roof, comprising: a drain outlet pipe adapted to be inserted into the annular roof drain pipe, said outlet pipe having a flange for attachment to the roof, and a seal on the outside of the outlet pipe having a relaxed diameter about the same as the internal diameter of the roof drain pipe for preventing the entry of backup water from the roof draining to the area beneath the roof including said seal being constructed of a molded elastomeric material having an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from an upper portion of the annular portion, the flange portion being semi-spheroidal in shape, and the flange portion being arcuate in cross-section and having an inner surface radially spaced from the outer surface of the annular portion, said flange portion being sufficiently flexible to permit the insertion of the outlet pipe into the drain pipe and to increase sealing pressure against the drain pipe upon water backup from the drain pipe, and means for preventing backup water pressure from escaping around the seal including said integral flange portion expanding against the roof drain pipe in response to backup water pressure against the inside of the integral flange portion.

10. A roof drain system as defined in claim 8, wherein the seal is constructed of a one-piece rubber elastomer having a Shore A durometer in the range of 30 to 95 to minimize backup leakage past the seal.

11. A roof drain system as defined in claim 8, wherein the seal has a Shore A durometer about 55.

12. A roof drain system as defined in claim 8, wherein the annular portion of the seal has an annular rim portion at the lower end thereof adapted to engage the lower end of the outlet pipe and to axially locate the seal relative to the outlet pipe, the flange portion is semi-spheroidal in shape, and the flange portion is arcuate in cross-section and has an inner surface radially spaced from the outer surface of the annular portion.

13. A roof drain system for annular roof drain pipes connected to a generally flat roof, comprising: a drain outlet pipe adapted to be inserted into the annular roof drain pipe, said outlet pipe having a flange for attachment to the roof, and a seal on the outside of the outlet pipe having a relaxed diameter about the same as the internal diameter of the roof drain pipe, said seal being constructed of a molded elastomeric material having an annular portion engaging the outer surface of the outlet pipe and an integral flange portion extending outwardly and downwardly from an upper portion of the annular portion, the flange portion being semi-spheroidal in shape, and the flange portion being arcuate in cross-section and having an inner surface radially spaced from the outer surface of the annular portion, said seal being constructed of a one-piece rubber elastomer having a Shore A durometer about 55, the annular portion of the seal having an annular rim portion at the lower end thereof adapted to engage the lower end of the outlet pipe and to axially locate the seal relative to the outlet pipe, and the flange portion being arcuate in cross-section and having an inner surface radially spaced from the outer surface of the annular portion, and means for preventing backup water pressure from escaping around the seal including said integral flange portion expanding against the roof drain pipe in response to backup water pressure against the inside of the integral flange portion.

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